SYSTEMS ANALYSIS AND MISSION SUPPORT (SAMS)

Solicitation No. 1-132-RB.0002

List of Respondees to Source Sought Synopsis

QSS Group, Inc.
4500 Forbes Boulevard, Suite 2000
Lanham, MD 20706

Analytical Services & Materials, Inc.
107 Research Drive
Hampton, VA 23666

TYBRIN Corporation
1030 Titan Court
Fort Walton Beach, FL 32547

Materials Sciences Corporation (MSC)
500 Office Center Drive, Suite 250
Fort Washington, PA 19034

Metacomp Technologies, Inc.
650 Hampshire Road, #200
Westlake Village, CA 91361

Morgan Research Corporation
2707 Artie Street, Suite 17
Huntsville, AL 35805

Midé Technology Corporation
56 Rogers Street
Cambridge, MA 02142

InDyne, Inc.
6862 Elm Street, Suite 700
McLean, VA 22101

Infocom Technology, Inc.
80 Ward Street, Suite 100
Paterson, NJ 07505

Noise Control Engineering, Inc.
799 Middlesex Turnpike
Billerica, MA 01821

Hernandez Engineering, Inc.
17625 El Camino Real, Suite 200
Houston, TX 77058

Jackson and Tull Chartered Engineers
7375 Executive Place, Suite 200
Seabrook, MD 20706

ADF Corporation
3003 Aerospace Parkway
Cleveland, OH 44142

Aero Systems Engineering(ASE) , Inc.
358 East Fillmore Avenue
St. Paul, MN 55107

SGT, Inc.
7701 Greenbelt Road, Suite 400
Greenbelt, MD 20770

Vigyan
30 Research Drive
Hampton, VA 23666

Federal Data Corporation
1700 Research Boulevard, Suite 400
Rockville, MD 20850

SFA, Inc.
1401 McCormick Drive
Largo, MD 20774

Ratheon Aerospace Corporation
555 Industrial Drive South
Madison, MI 39110

Thermal & Flow Engineering, Inc.
2121 Eisenhower Avenue, Suite 2000
Alexandria, VA 22314

Proton Aerospace
880 Jupiter Park Drive, Suite 16
Jupiter, FL 33458

Lockheed Martin Engineering & Sciences
Langley Program Office
c/o NASA Langley Research Center, MS 371
Hampton, VA VA 23681

Rannoch Corporation
1800 Diagonal Road, Suite 430
Alexandria, VA 22314

Hamilton Beach/Procter Silex
1421 Waterfron Drive
Glen Allen, VA 23060

Cimarron
1830 NASA Road 1
Houston, TX 77058

Advanced Design Corporation (ADC)
8560 Cinder Bed Road, Suite 100
P. O. Box 8560
Newington, VA 22122

Kalman & Company, Inc.
#5 The Koger Center, Suite 216
Norfolk, VA 23502

Taitech Research and Engineering
1430 Oak court, Suite 301
Beavercreek OH 45430

Sparta, Inc.
244 E. Avenue, K-4
Lancaster, CA 93535

Honeywell, Inc.
P. O. Box 21111
Phoenix, AZ 85036

Aerophysics Research Corp.
11123 141st Place, NE
Kirkland, WA 98034

DynCorp Technical Services, Inc.
One Ridgmar Centre
6500 West Freeway, Suite 600
Fort Worth, TX 76116

Aerospace Innovations, LLC
4822 George Washington Memorial Highway, Suite 200
Yorktown, VA 23692

Quadrus Corporation
1015-116 Atlantic Boulevard
Atlantic Beach, FL 32233

Geneva Aerospace, Inc.
P. O. Box 613018
Dallas, TX 75261-3018

Sverdrup Technology, Inc.
600 William Northern Boulevard
Tullahoma, TN 37388

Wiltex, Inc.
2532 Las Corrales Court
Virginia Beach, VA 23456-4200

Science and Technology Corporation
10 Basil Sawyer Drive
Hampton, VA 23666

Zel Technologies, LLC
55 West Queens Way, Suite 208
Hampton, VA 23669

Micro Craft, Inc.
207 Big Springs Avenue
P. O. Box 370
Tullahoma, TN 37388

Syscom Development, Inc.
1110 Nasa Road, Suite 111
Houston, TX 77058

Science Applications International Corporation (SAIC)
One Enterprise Parkway, Suite 200
Hampton, VA 23666

Micro Analysis and Design, Inc.

Airborne Systems Competency Areas of Expertise

- Flight Dynamics
- Guidance & Control
- Crew Station Design and Integration
- Electromagnetics
- Mission-critical Digital Avionics Systems (including software)
- Aircraft Operations
- Piloted Simulation
- Research Systems Development

Key Personnel Assignments

Airborne Systems Competency

P. Douglas Arbuckle, Director
Luat T. Nguyen, Deputy Director for Controls, Flight Deck, and Flight Crucial Systems
H. Milton Holt, Deputy Director for Electromagnetics, Flight and Simulation Experimentation
Robert V. Gifford, Aviation Manager
Douglas B. Price, Special Assistant
Kathy H. Abbott, FAA National Resource Specialist for Flight Deck Human Factors
Kendall W. Sherman, Service Activity Manager
Vacant, Business Manager
Loutricia S. Johnson, Administrative Officer
L. David Wall, Center R&T Support Contracts Manager
Sandra G. Johnson (Lead)/Jo Ann H. Woodcock/Susan L. Conry, Secretaries

Simulation-to-Flight Office

Charles E. Knox, Manager

TRF Project Office

Richard H. Couch, Manager

Vehicle Dynamics Branch

Dana J. Dunham, Head

Dynamics & Control Branch

Dana J. Dunham, Acting Head
Martin R. Waszak, Acting Assist. Head

Guidance & Control Branch

Daniel D. Moerder, Acting Head

Crew Systems & Operations Branch

Sally C. Johnson, Head

Crew/Vehicle Integration Branch

Kelli F. Willshire, Head

Systems Integration Branch

Plesent W. Goode, Head

Assessment Technology Branch

Raymond S. Calloway, Head

Sensors Research Branch

Harry F. Benz, Head
Bruce M. Kendall, Assistant Head

Electromagnetics Research Branch

Thomas G. Campbell, Head

Aircraft Systems Branch

Tony L. Trexler, Head

Pilots Office

Harry A. Verstynen, Chief Pilot
Robert Rivers, Aviation Safety Officer

Quality Assurance Office

Michael A. Klebitz, Lead

Operations Engineering & Logistics Office

Lucille H. Crittenden, Lead

Airworthiness & Configuration Management

Brenton W. Weathered

Planning & Resources Office

Anita M. Thomas, Lead

Systems Development Branch

Carey S. Buttrill, Head
Vacant, Assistant Head

Approved: Original signed by P. D. Arbuckle
Organizational Unit Manager

Date: 12-17-99

ADVANCED ELECTROMAGNETIC TECHNOLOGY

- Computational Electromagnetic (CEM) Analysis
- High Intensity Radiated Fields (HIRF), EMI/EMC Testing
- Advanced Antenna Design
- Radar Cross Section (RCS) Measurements
- EM Material Characterization

AOE 6: CREW SYSTEMS

Situation Awareness Assessment

Synthetic Vision

Reduced Aircraft Spacing

Human-Centered Design

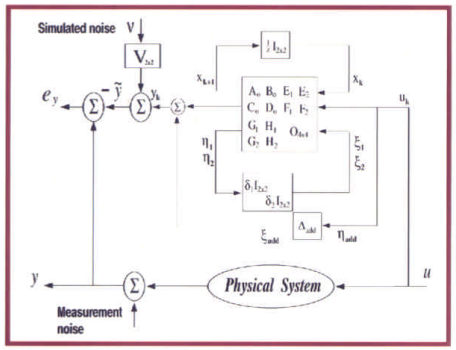
Tactical Weather Avoidance

Strategic Route Planning

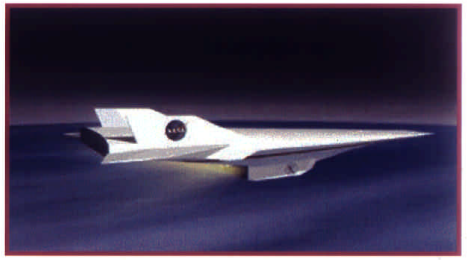
AOE 5: CONTROLS

Frequency / Time Dependency

Robust Theory

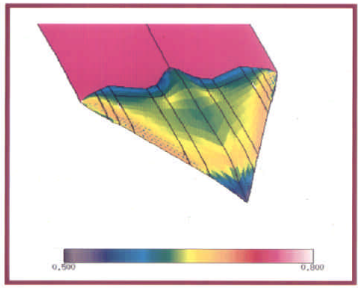


Transatmospheric Flight

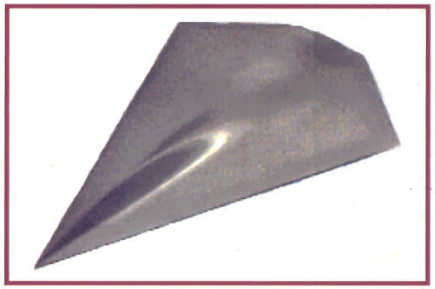


Dynamic Aeroelasticity

Multidisciplinary Integration



Controls Allocation / Reconfiguration



Multidisciplinary Modeling & Analysis

Guidance & Control Theory

Control Law Design

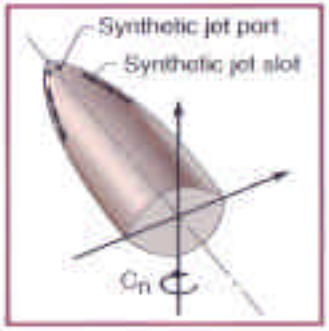
AOE 4: FLIGHT DYNAMICS

Vehicle Stability and Control

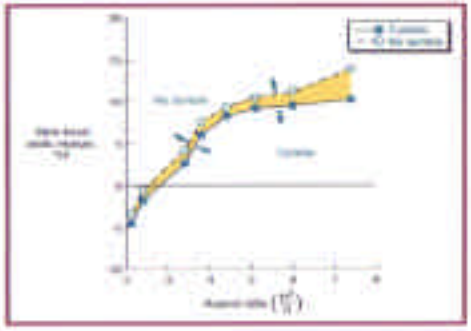
Spin Characteristics

Control Power Requirements

Control Concepts

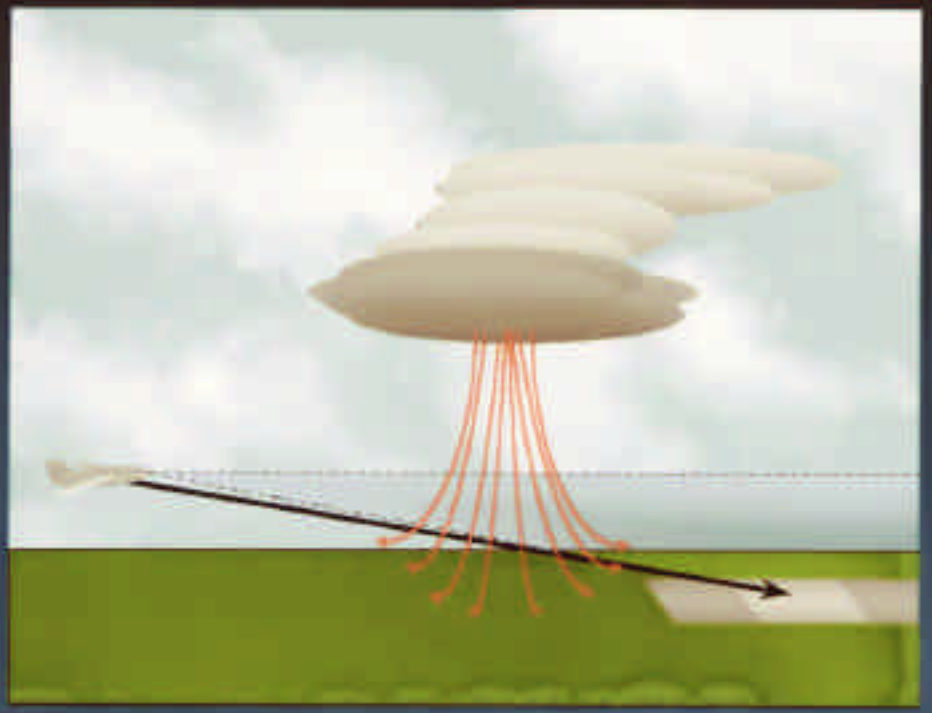


Design Criteria



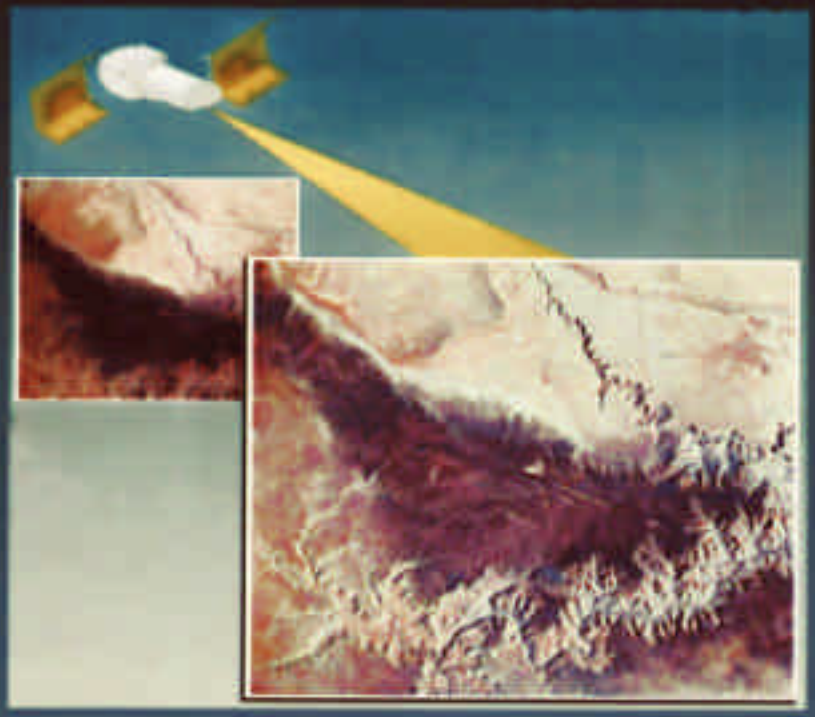
Sensor Systems Research

Aero-Focused Development



- Windshear Radar
- HSR - XVS
- AvS
  - Turbulence
  - EWxR
  - EVS

Space Technology



- Advanced Imaging
- Radiometry
- Semiconductor Lasers for LIDAR
- Retinex

NASA Langley Research Center

Electromagnetics Research & Testing Laboratories

NASA

Scale Model of B-737 in Antenna Chamber

Reverberation Chamber in the High Intensity Radiated Fields Laboratory

Installation of 28 Ft. Reflector in Experimental Test Range

Almond Calibration Test Model in RCS Compact Range

Gigahertz Transverse Electromagnetic Mode (GTEM) Test Cell

Scale Model Automobile in Antenna Test Chamber

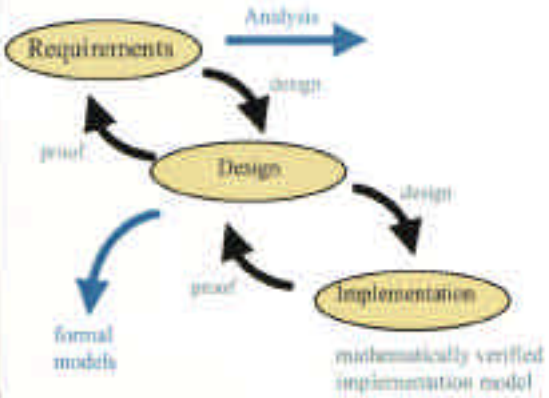
National Aeronautics and Space Administration — Langley Research Center

Develop and demonstrate methodologies for designing and verifying high integrity digital and electromagnetic systems in mission or life critical aerospace applications.

FCC in HIRF Test Chamber

Flight Simulation in Closed-Loop Sys. Lab

Methods to Assess EME Upset on Aviation Electronics



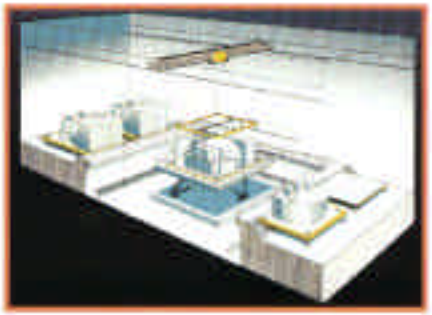
Formal Methods

Health Management & Flight Critical System Design Technologies

Research Aircraft and Research Simulators

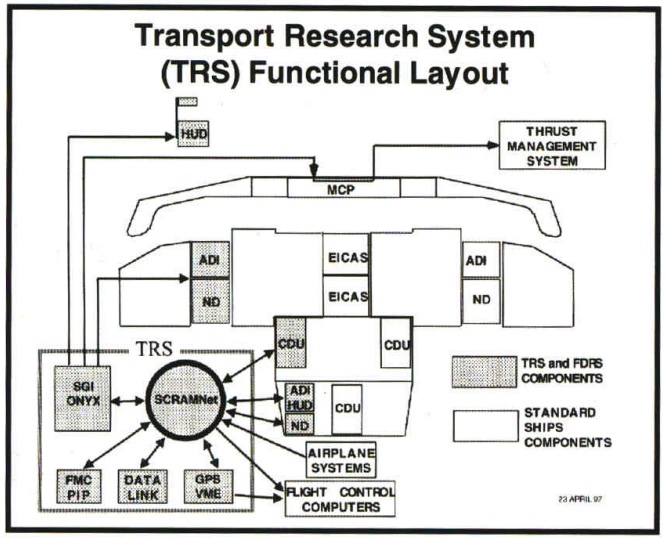
Differential Motion Simulator (DMS)

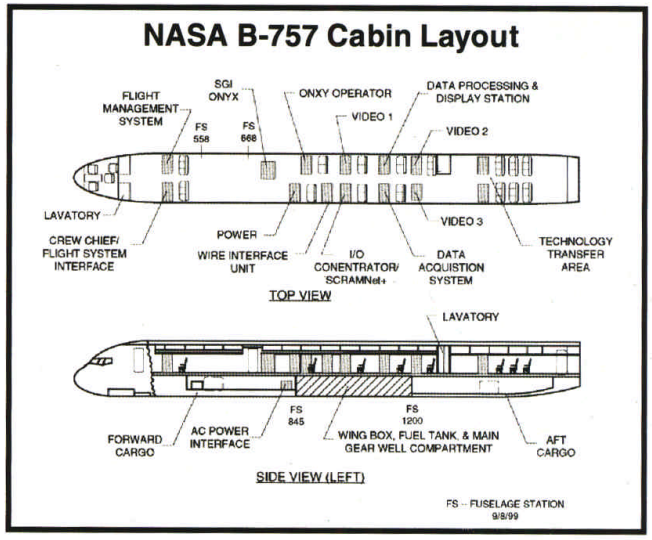
Visual Motion Simulator (VMS)



Cockpit Motion Facility (CMF)

NASA ARIES B-757





SOLICITATION 1-132-RB.0002
SAMS PRE-PROPOSAL CONFERENCE
APRIL 25, 2000

NAME	COMPANY AFFILIATION	PHONE #
Frank Allario	RTI	757-827-1160
Mohammad Aminpour	Applied Research Associates	206-523-3477
Richard August	FDC	757-864-9859
Philip Ardanay	Raytheon	301-794-5537
Paul Barnhart	FDC	757-864-9855
Don Bishop	InDyne, Inc.	703-903-6900
Charles Blackburn	AS&M	757-865-7093
Greg Boeshaar	Science & Technology Corp.	757-766-5807
Tzong H. Chen	Taitech, Inc.	937-431-1007
James Cook	SAIC	757-825-0001
Adarsh Deepak	STC	757-766-5801
Haldun Direskeneu	SMSA	757-864-8890
Bob Drosdzak	CSC	703-641-2057
David Edwards	Wyle Labs	757-865-0000
Jordan Evans	Swales Aerospace	301-902-4241
Wanda Fegnch	Lockheed Martin	301-805-0506
Robert Fitzgerald	Jackson and Tull	301-805-4545
Bruce Foster	Dyncorp	757-864-2938
Cecil Gibb	Hernandez Engineering Inc.	757-865-8168
A. Guastaferro	AG Consultants	757-258-3039
Pat Haney	Lockheed Martin	757-864-5536
Andrew Hernandez, Jr.	Hernandez Engineering, Inc.	281-280-5159
Miguel A. Hernandez, Jr.	Hernandez Engineering Inc.	281-280-5159
Cornelius Higgins	Applied Research Associates, Inc.	703-329-0200
Ted Holtz	Aerospace Innovations, LLC	757-875-5144
Bruce Howard	Government Micro Resources (GMR)	703-330-1199
Richard Hurtz	SPARTA	661-723-3148
Frank Islam	QSS	301-429-0308
Phil Johnson	Lockheed Martin	301-805-0400
Thomas A. Johnson	Aerospace Innovations, LLC.	757-875-5144
Barbara Kalman	Kalman & Co, Inc.	757-461-4292
Eric Kalman	Kalman & Co, Inc.	757-461-4292
Rocky Kimpel	SM&A	757-867-7557
Norm Knight	Veridian MRJ	757-867-6394
Gary Kollmoregen	BMH Associates, Inc.	757-857-5670
Jack Koletty	Unisys U.S. Federal Govt. Group	703-556-5265
Renjith Kumar	AMA	757-865-0944
Randy Locke	DYNACS	216-433-6110
Daniel Lowe	Sierra Lobo, Inc.	419-621-9931
Bill Mahlor	Raytheon	757-865-1095

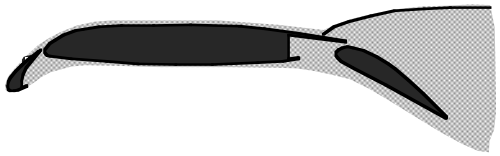
Hemant Mainthia	Mainthia Technologies, Inc.	440-816-0202
Herb Majower	Swales	301-593-6619
Siva Mangalam	TAO Systems	757-220-5040
Randy Manning	NASA OP	757-864-6074
Sudhirc Mehrotra	Vigyan	757-865-1400
Jim McCaulley	Dyncorp	281-244-9700
Chuck McKinley	SAIC	757-827-4845
John Mitchell	FDC	757-864-1300
Archie Moore	SPARTA	661-723-3148
Steve Murray	CSSI, Inc.	202-863-2175
John Payne	Raytheon	281-280-4657
Patricia Rainey	Boeing	301-464-7462
Beth Ranson	InDyne, Inc.	703-903-6939
Lonnie Reid	AP Solutions, Inc.	216-433-3646
Richard Riggs	BD Systems, Inc.	321-853-4737
Paul Sensmeier	Sverdrup Technology, Inc.	757-827-1786
Hans Seywald	AMA	757-865-0944
Grady Sidebe	BD Systems, Inc.	256-882-2650
Paul H. Smith	Veridian MRJ	703-277-1215
Candance Solomon	InDyne, Inc.	703-903-6943
Norb Smith	The Boeing Company	757-896-1107
Fred Staggs	Self	757-898-9045
Bob Sues	AGA	918-876-0018
Tom Swissler	QSS	410-729-1399
Anita Talwar	AMTI	703-841-AMTI
Marty Talwar	AMTI	703-841-AMTI
Rita Tang	Rannoch Corporation	703-838-9780 x 216
R. Tolson	Self	757-864-2798
Jalaiah Unnam	AS&M	757-865-7093
Roy Vaughn	Amsec M. Rosenblatt & Son	757-873-0611
Scott Wagner	DYNACS	757-877-2323
Cindy Walters	AMA	757-865-0944
Genevra Webb-Conlee	Dynamic Engineering, Inc.	757-873-1341
Don Weisert	MTC	937-252-9199
Richard White	Vigyan	757-865-1400
Chuck Whittenberg	MTC	757-838-9152
Joe Williams	CSSI, Inc.	202-863-2175
Tom Wilson	Swales Aerospace	301-902-4484
George Wood	Science and Technology Corp.	757-766-5800
Dave Ziobro	CSC	301-794-4000

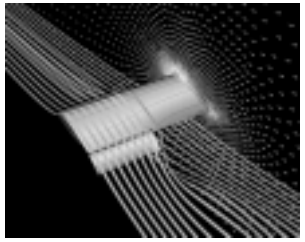
Aerodynamics, Aerothermodynamics, and Acoustics Competency
Areas of Expertise

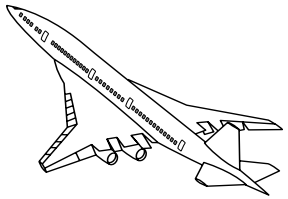
- Development, assessment, and application of aerodynamic and component integration technologies to enable development of advanced subsonic, supersonic, and high performance aircraft
- Development, assessment, and application of acoustic technologies in the development of advanced aerospace systems and to meet environmental requirements
- Development, assessment, and application of aerothermodynamic technologies to enable development of hypersonic aircraft, launch vehicles, and planetary/earth entry systems
- Development, assessment, and application of hypersonic airbreathing propulsion technologies to enable development of hypersonic airbreathing vehicles
- Development, assessment, and application of testing technologies to enable aerospace research through testing and experimentation in ground facilities
- Management and operation of aerodynamic, aerothermodynamic, acoustic, and hypersonic propulsion facilities for testing on a broad class of aerospace vehicles

AA.AE.01 Aerodynamic and Component Integration Technologies

Develop, assess, and apply aerodynamic and component integration technologies to enable development of advanced subsonic, supersonic, and high performance aircraft

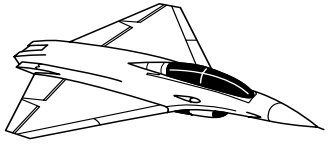






Products

- Vehicle performance, stability, and control
- Aerodynamic design tools and methodologies
- Advanced aerodynamic configurations for fixed wing, rotorcraft, and airbreathing propulsion concepts
- High lift and component integration aerodynamics
- Flow physics understanding and modeling
- Innovative flow control techniques



AA.AE.02 Aerothermodynamic Technologies

Develop, assess, and apply aerothermodynamic technologies to enable development of hypersonic aircraft, launch vehicles, and planetary earth entry systems

Products

- **Concept screening for flyability/survivability**
- **Configuration optimization**
- **Flight environment definition (benchmarking)**
- **Design tools and methodologies**

X-33

X-34

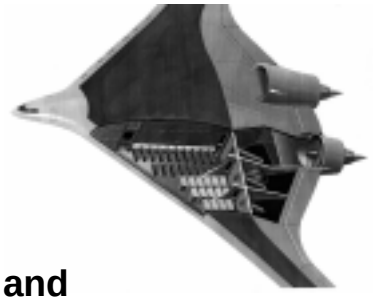
Hyper-X

Planetary

X-38

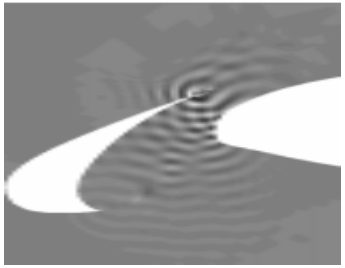
AA.AE.03 Acoustic Technologies

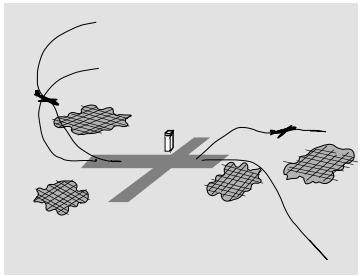
Develop, assess, and apply acoustic technologies in the development of advanced aerospace systems and to meet environmental requirements



Products

- **Computational methods for aeroacoustic design and analysis**
- **Airframe, fan, jet exhaust, and rotor noise control**
- **Active and passive aircraft interior noise control**
- **Advanced acoustic configuations for aerospace vehicles**
- **Sonic fatigue resistant aerospace structures**
- **Aeroacoustic measurements and flow diagnostics**
- **Community and passenger noise impact assessment**





Langley
Aerodyna
and Acoustics Competency

AA.AE.04 Hypersonic Airbreathing Propulsion Technologies

Develop, assess, and apply hypersonic airbreathing propulsion technologies to enable development of hypersonic airbreathing vehicles

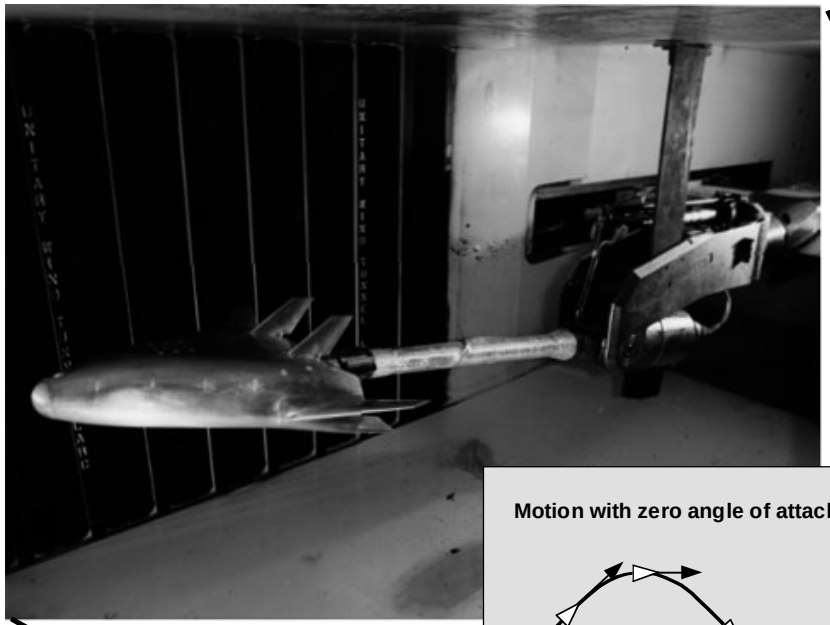
Small-scale parametric scramjet

Products

- **Scramjet engine flowpath design and performance**
- **Design tools and methodologies**
- **Fundamental physics of mixing and combustion**
- **Advanced testing techniques for scramjets**
- **Scramjet test facility development**

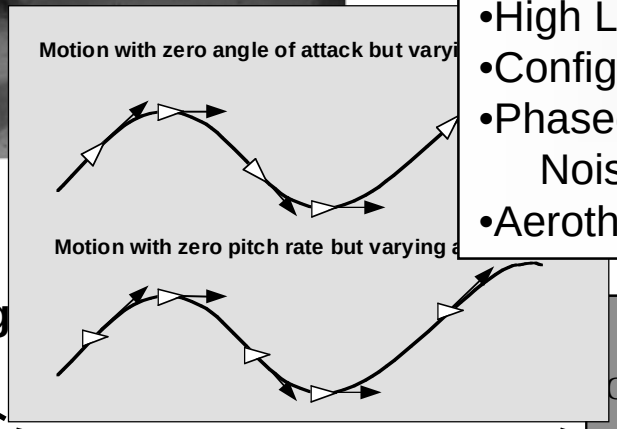
AA.AE.05 Test Capabilities For Industry

Manage, operate, and provide aerodynamic, aerothermodynamic, acoustic, and aero- and hypersonic-propulsion test capabilities for industry research and development on a broad class of aerospace vehicles.



Test Capabilities include:

- Supersonic performance
- Transonic performance testing at Flight Reynolds Number
- Dynamic Stability testing
- Static & Dynamic Ground Effects Testing
- Propulsion/Airframe Integration
- Rotorcraft Testing
- High Lift System Performance
- Configuration Screening
- Phased Microphone Array for Noise Source Identification
- Aerothermal Loads Testing

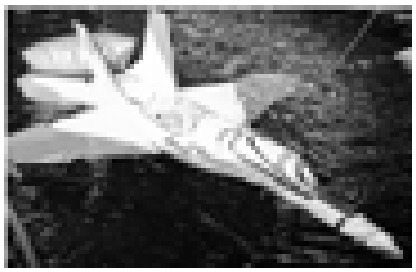


Dynamic Stability testing of X33 model in UPWT

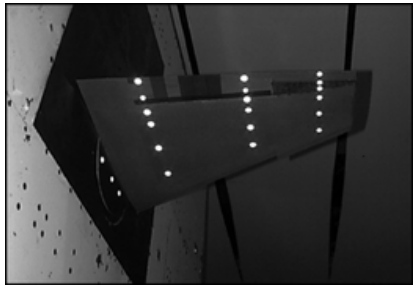
Damping-in-pitch,
$C_{m_q} + C_{m_\alpha}$
Oscillatory longitudinal stability,
$C_{m_\alpha} - k2\ C_{m_\theta}$
Damping-in-yaw,
$C_{n_\rho} - C_n \cos\alpha$
•
•
•

AA.AE.06 Experimental Testing Technologies

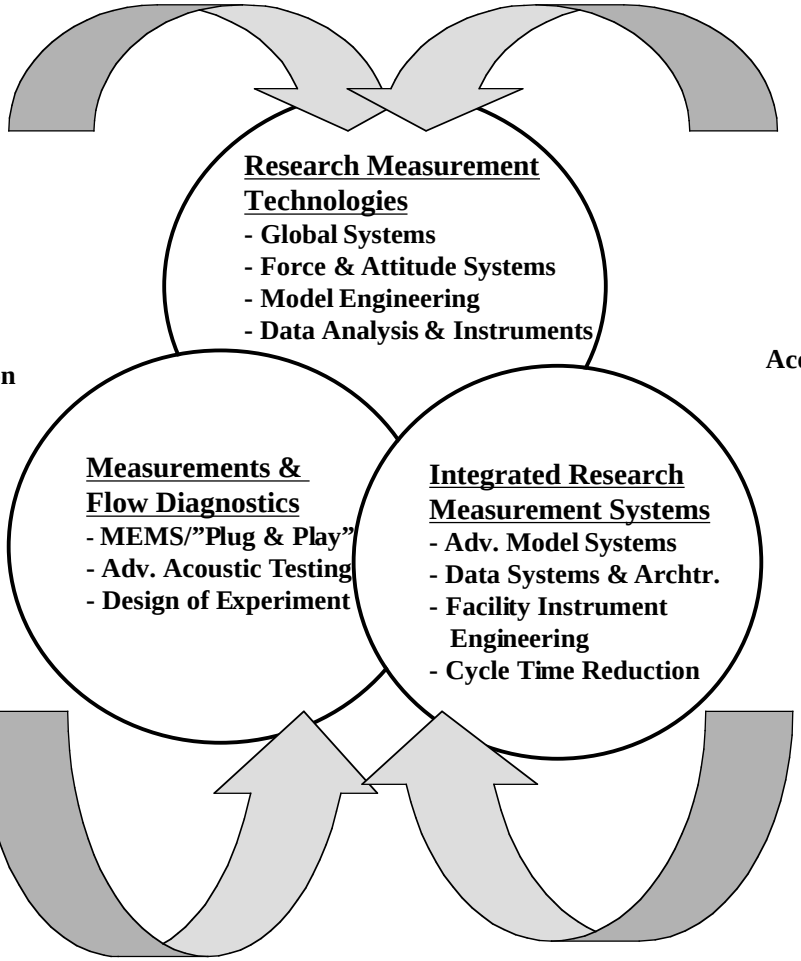
Develop, assess, apply, and integrate experimental testing technologies including test articles, instrumentation, data systems and test techniques to enable aero-space research through testing and experimentation in ground facilities.

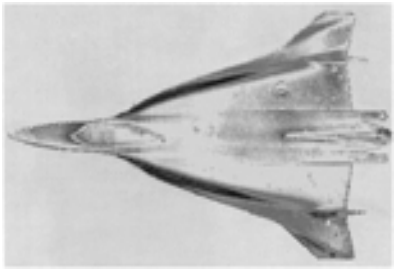


Model Engineering & Instrumentation



Acoustical, Optical, & Chemical Measurements





Aerodynamics Measurements

Data Systems & Instrument Support

Langley Research Center
Aerodynamics, Aerothermodynamics, and Acoustics Competency

Systems Analysis and Mission Support

Preproposal Conference

Solicitation 1-132-RB.0002

NATIONAL AERONAUTICS & SPACE ADMINISTRATION
LANGLEY RESEARCH CENTER

APRIL 25, 2000

SOLICITATION 1-132-RB.0002
SYSTEMS ANALYSIS & MISSION SUPPORT

PREPROPOSAL CONFERENCE

AGENDA

• **INTRODUCTION, SOURCE EVALUATION PROCESS, & PROJECTED SCHEDULE**	**HEDGEPETH**	**9:00 - 9:30**
• **WORK AREA OVERVIEWS:**		
– **AERODYNAMICS, AEROTHERMODYNAMICS & ACOUSTICS COMPETENCY**	**PAULSON**	**9:30 - 9:40**
– **AIRBORNE SYSTEMS COMPETENCY**	**PRICE**	**9:40 - 9:50**
– **STRUCTURES & MATERIALS COMPETENCY**	**SHUART**	**9:50 - 10:00**
– **SYSTEMS ENGINEERING COMPETENCY**	**TAYLOR**	**10:00 - 10:10**
– **AEROSPACE SYSTEMS , CONCEPTS & ANALYSIS**	**WEAVER**	**10:10 - 10:20**
– **SPACE ACCESS AND EXPLORATION PROGRAM OFFICE**	**McCLINTON**	**10:20 - 10:30**
• **BREAK**		**10:30 - 10:45**
• **QUESTION & ANSWERS**	**WEIH**	**10:45 - 11:30**
• **LUNCH**		**11:30 - 1:00**
• **FACILITY TOURS**		**1:00 - 3:00**

(STRUCTURES LAB, COLTS, LANDING LOADS & 14X22 TUNNEL)

Solicitation 1-132-RB.0002
SYSTEMS ANALYSIS AND MISSION SUPPORT

INTRODUCTION

- ALMOST ALL OF THE FACILITIES AND ORGANIZATIONS AT LaRC RECEIVE SERVICES UNDER THIS PROCUREMENT.
- SKILLS REQUIRED RANGE FROM DOCUMENTARIAN TO SENIOR RESEARCH SCIENTISTS.
- RESULTING CONTRACT WILL BE EXPECTED TO FEATURE A HIGH DEGREE OF FLEXIBILITY AND RESPONSIVENESS.
- EFFORTS ARE DEEMED “ESSENTIAL” BY ALL LEVELS OF MANAGEMENT.

SOLICITATION 1 - 132 - RB.0002
SYSTEMS ANALYSIS & MISSION SUPPORT

GENERAL GUIDANCE

- COPIES OF VIEWGRAPHS AND AN ATTENDANCE LIST WILL BE PROVIDED WITH THE FINAL RFP.

- ALL REVISIONS TO THE RFP WILL BE IN WRITING; NOTHING SAID HERE TODAY SHOULD BE CONSTRUED AS REVISION UNLESS SUBSEQUENTLY CONFIRMED IN THE FINAL RFP OR BY WRITTEN AMENDMENT.

- PREVIOUSLY SUBMITTED QUESTIONS WILL BE ADDRESSED DURING THE Q&A PERIOD. WRITTEN QUESTIONS TO BE COLLECTED DURING THE BREAK WILL BE ADDRESSED AT FINAL RFP RELEASE.

- AFTER THE FINAL RFP IS RELEASED, ALL QUESTIONS MUST BE SUBMITTED TO MR. WEIH.

SOLICITATION 1-132-RB.0002
SYSTEMS ANALYSIS AND MISSION SUPPORT

ESTIMATED CONTRACT STATISTICS

DIVISION OF EFFORT

• AIRBORNE SYSTEMS COMPETENCY	26%
• AAAC	18%
• S&M	17%
• S&E	13%
• SPACE ACCESS AND EXPLORATION OFFICE	10%
• AEROSPACE SYSTEMS, CONCEPTS & ANALYSIS	8%
• OTHERS	8%

SOLICITATION 1-132-RB.0002
SAMS PREPOSAL CONFERENCE - APRIL 25, 2000

NAME	COMPANY AFFILIATION	PHONE #

Solicitation 1-132-RB.0002

SYSTEMS ANALYSIS AND MISSION SUPPORT

PROCUREMENT INFORMATION

- ANY COMMUNICATION IN REFERENCE TO THIS DRAFT RFP MUST BE DIRECTED TO TOM WEIH, OR IN HIS ABSENCE, ROSEMARY FROEHLICH - SEE SECTION L.11

- THE RESULTANT CONTRACT WILL BE A SMALL BUSINESS SET-ASIDE UNDER SIC CODE 8731 - 1,500 EMPLOYEES

- THIS FOLLOW-ON PROCUREMENT REPRESENTS A CONSOLIDATION OF TWO LARC CONTRACTS:
  - NAS1-96013 WITH FDC/NYMA FOR SYSTEMS ANALYSIS AND ENGINEERING RESEARCH SUPPORT (SAERS)
  - NAS1-96014 WITH LOCKHEED FOR AEROSPACE RESEARCH AND TECHNOLOGY SERVICES (ARTS)

- PROPOSALS RECEIVED IN RESPONSE TO THE FINAL RFP WILL BE EVALUATED BY A NASA SOURCE EVALUATION BOARD (SEB) IN ACCORDANCE WITH NASA FAR SUPPLEMENT 1815.3. NOTE: THE FINAL RFP WILL BE REVISED TO REFLECT THE CORRECT NASA FAR SUPPLEMENT REFERENCE.

Solicitation 1-132-RB.0002

SYSTEMS ANALYSIS AND MISSION SUPPORT

PROCUREMENT INFORMATION

- IT IS LANGLEY'S INTENTION IS TO AWARD THE CONTRACT WITHOUT DISCUSSIONS IN ACCORDANCE WITH SECTION L.3, INSTRUCTIONS TO OFFERORS - COMPETITIVE ACQUISITION (FAR 52.215-1).

- ALL REFERENCES SUBMITTED IN RESPONSE TO THE INSTRUCTIONS ON PAST PERFORMANCE MAY BE CONTACTED BY NASA. PLEASE INSURE THAT THIS INFORMATION IS COMPLETE AND ACCURATE.

- THIS SOLICITATION INCLUDES WAGE DETERMINATIONS APPLICABLE TO THE "SERVICE CONTRACT ACT".

- COMPUTERIZED COST PROPOSAL - PLEASE READ THE INSTRUCTIONS CAREFULLY AND COMPLY WITH EACH REQUIREMENT (SECTION L.13 DRFP)

- INFORMATION REGARDING AN ELECTRONIC BIDDERS LIBRARY IS CONTAINED IN SECTION L.12. ALL OFFERORS ARE ENCOURAGED TO USE THE INFORMATION CONTAINED IN THE LIBRARY.

Solicitation 1-132-RB.0002
SYSTEMS ANALYSIS AND MISSION SUPPORT

RESPONSIBLE ORGANIZATIONS

Technical

Aerospace Systems, Concepts & Analysis Competency - William Gilbert
Aerodynamics, Aerothermodynamics, and Acoustics Competency - Ajay Kumar
Structures and Materials Competency - Mark Shuart
Airborne Systems Competency - Douglas Arbuckle
Systems Engineering Competency - Sammie Joplin
Other Program Offices and Organizations -

Procurement

Procurement Officer - Kimberly Stone
Contracting Officer - Rosemary Froehlich
Contract Specialist - Tom Weih

Solicitation 1-132-RB.0002
SYSTEMS ANALYSIS AND MISSION SUPPORT

SOURCE EVALUATION BOARD

- Voting Members:
  - Robert K. Hedgepeth (Chair), AAAC
  - Craig S. Cleckner, SEC
  - C. Tom Weih, Office of Procurement
  - Marilyn E. Ogburn, AirSC
  - Stan S. Smeltzer, SMC

- Recorder:
  - Jennifer D. McCardell, AAAC

- Price/Cost Analyst:
  - Jeanne D. Covington, Office of Procurement

- Office of Chief Counsel:
  - Kevin E. Love

SOLICITATION 1-132-RB.0002
SYSTEMS ANALYSIS & MISSION SUPPORT

TENTATIVE SCHEDULE

- COMMENTS DUE — MAY 5, 2000
- FINAL RFP RELEASE — MAY 19, 2000
- PROPOSALS DUE — JUNE 19, 2000
- CONTRACT AWARD — NOV. 1, 2000
- CONTRACT START — JAN. 1, 2001

Questions to the Draft RFP

1-132-RB.0002

Question 1. RFP L.13.B.1.(b) - Can a smaller font such as 8 point be used for graphics and tables?

Answer: 8-point font or higher is acceptable for graphics and tables provided that it is legible. This change will be reflected in the final RFP.

Question 2. Attachment 4 contains an Excel sheet entitled "Rate Chart." This sheet contains no data. Please provide additional instructions for the purpose of the Rate Chart.

Answer: The sheet entitled "Rate Chart" is there to provide a single place to display all rates, factors, and assumptions that are used in the Cost Form formulas. The use of the "Rate Chart" sheet is optional.

Question 3. Would the government provide the current ADP required seats by ODIN seat type?

Answer: ODIN information is currently unavailable. The nature and magnitude of ADP equipment and software that is currently being provided by the Government can be determined by reviewing the contracts and task orders contained in the Bidders Library.

Question 4. ADP Equipment (L.13.F.1.e) - For cost estimating purposes, please provide the quantities and types of ADP equipment and software (both CAD/analysis and PC workstation) that are currently being provided by the Government to the SAERS and ARTS contracts.

Answer: The nature and magnitude of ADP equipment and software that is currently being provided by the Government can be determined by reviewing the contracts and task orders contained in the Bidders Library.

Question 5. Can this equipment be utilized during contract phase-in to minimize work interruption?

Answer: The new Contractor will not perform Task Orders during the phase-in period. Consequently, no ADP equipment will be needed during this period.

Question 6. Should ODIN contractor support/equipment be delayed past November 1, 2000 into the contract effective date, can existing workstation equipment be utilized until ODIN support is available?

Answer: If the new Contractor clearly specifies the use of the ODIN contract to obtain ADP Equipment in their proposal, and if the ODIN contract is delayed beyond January 1, 2001, then existing ADP Equipment will be made available until the ODIN contract is

complete. In all other cases, existing workstation equipment will not be provided under the SAMS contract in accordance with FAR 45.302-1. Your attention is directed to Section L, L.13.F.1.e, which states that the Contractor shall supply and maintain automatic data processing (ADP) equipment and software for their use on this contract. Material, special test equipment, special tooling, or Agency peculiar property will be either charged direct to the contract or provided by the Government on a Task Order Basis.

Question 7. Can the required cost and staffing data for the Representative Task Orders be submitted in the Business Volume (Volume II), or are these data required in the Technical Proposal and subject to the 75 page limit?

Answer: The required cost and staffing data for the Representative Task Orders must be submitted with Technical Proposal – Volume I and will be subject to the 75 page limitation.

Question 8. Section G.1(f)(1) states that provisional fee payments will not be paid. Sections G.1(f)(2), (3), and (4) appear to describe how provisional fee will be handled. Which is correct?

Answer: Considering the award fee pool will not be finalized until the end of each 6-month evaluation period, provisional fee payments will not be made under this contract. However, any proposed methodologies on provisional fee payments submitted on or before May 5, 2000 will be considered by the Government.

Question 9. Section H.3 requires work performance (work hours/hours of work) to be consistent with the Government. Does this extend to Government holidays as well?

Answer: Offerors are referred to Section I, NASA FAR Supplement clause 1852.242-72, Observance of Legal Holidays – Alternate I for information regarding Government Holidays

Question 10. Our interpretation of Section I.6 is that overtime is allowable under the specified circumstances, but that the Government must approve all overtime. Is this correct?

Answer: Overtime is permitted without Government approval in the circumstances stated in paragraph (a)1 through (a)4 of FAR 52.222-2, Payment of Overtime Premiums.

Question 11. Please elaborate on - Volume I, Subfactor 1 Section L instructions to correlate the offeror's and subcontractor's expertise to each of the broad functional areas in the SOW ?

Answer: The instructions contained in Section L.13 of the RFP are provided in sufficient detail for offerors to provide an adequate response to the area in question.

Question 12. Please elaborate on (or better distinguish between) Volume I, Subfactor 2 Section L (3rd paragraph) instructions to describe the capabilities and depth of the offeror's organization (including subcontractors) for efficiently and effectively performing the contract effort?

Answer: The instructions contained in Section L.13 of the RFP are provided in sufficient detail for offerors to provide an adequate response to the area in question.

Question 13. Please elaborate on (or better distinguish between) - Business Volume, Factor 3, Past Performance requirements relative to related performance on other Contracts?

Answer: The instructions contained in Section L.13 of the RFP are provided in sufficient detail for offerors to provide an adequate response to the area in question.

Question 14. Is the letter from the Offeror committing to an ISO-9001 compliance schedule included in the Volume I page limit?

Answer: The letter is not included in the Volume I page limitation. This change will be reflected in the final RFP.

Question 15. Section D of the Draft RFP appears to be missing. Was this section intentionally omitted?

Answer: Section D was intentionally omitted as there are no clauses from that Section applicable to this procurement.

Question 16. Under the two current contracts, on-site office space is made available for Program Management personnel. Does the government intend to make space available for SAMS Program Management?

Answer: The Government intends to make space available for the SAMS Program Management.

Question 17. Will the compensation plan required under Subfactor 2 be counted in the 75 page limitation?

Answer: The compensation plan will be counted in the 75 page limitation.

Question 18. Please consider including hub-zone requirements into the contract.

Answer: In accordance with FAR Part 19, hub-zone requirements are not applicable to procurements set-aside for small businesses.

Question 19. Is there a moratorium on contractor visits/discussion about SAMS? Will the blackout coincide with the RFP release?

Answer: There is not a moratorium on contractor visits/discussion about SAMS; however, considering that the evaluation criteria have been released, it is requested and highly recommended that you pose all visits/discussion to Tom Weih. The official blackout will coincide with the final RFP release.

Question 20. Are the aircraft maintenance requirements still a part of SAMS?

Answer: The aircraft maintenance requirements are not a part of SAMS. These requirements will be fulfilled via another contract vehicle.

Question 21. RFP B.3 Award Fee - We recommend that the Government specify the award fee percentage, within the range of 8-10%, for all offerors to propose rather than have each offeror set their own fee percentage. Since the award fee is the Government's primary means of rewarding or encouraging improvements in performance we believe that it is in the Government's best interest to make sure that the percentage is large enough to warrant substantial attention from the contractor. If an offeror proposes a low award fee percentage their interest in performing to meet award fee evaluation criteria and their corporate interest in the SAMS contract are likely to be less than a contractor whose potential earned award fee is more substantial. Allowing an offeror to propose a low award fee percentage could result in a cost discriminator which would in fact have a negative impact on performance after contract award and defeat the purpose of the source selection process- providing the best contract service possible to SAMS contract users.

Answer: The Government does not plan on specifying an award fee percentage for this competition.

Question 22. RFP C.1 Statement of Work – Paragraph 4.3 Although the paragraph heading is titled Aircraft and Aircraft Systems Maintenance and Operations, the following paragraphs do not specify the requirement for typical aircraft maintenance. Are the aircraft in the Langley fleet going to be maintained under the SAMS effort?

Answer: The aircraft maintenance requirements are not a part of SAMS. These requirements will be fulfilled via another contract vehicle.

Question 23. RFP Statement of Work 9.0, Electronic Task Order System

a.) Is there an existing Electronic Task Order System which was funded by the Government for contractor use? If so, will information be provided regarding its capabilities, interfaces, and hardware/software platform requirements?

b.) Will the Government provide information regarding the interfaces (hardware, software) with which the Electronic Task Order System must be compatible?

Answer: There is not an existing Electronic Task Order System. There are no existing hardware/software platform requirements. Expected interfaces will be PC, MAC, and UNIX based systems.

Question 24. RFP G.1(f)(1) - Provisional award fee payments are normally allowed under NASA contracts. Will the Government reconsider allowing provisional award fee payments under the SAMS contract?. For small businesses it is very important to have regular cost and fee payments to meet fiscal obligations. Subparagraphs (2) through (4) which follow ensure that the Government's interests are well protected.

Answer: Considering the award fee pool will not be finalized until the end of each 6-month evaluation period, provisional fee payments will not be made under this contract. However, any proposed methodologies on provisional fee payments submitted on or before May 5, 2000 will be considered by the Government.

Question 25. RFP G.14 - Are the labor rates provided in the tables to be direct labor rates, loaded through G&A, or loaded through award fee? L13.G. specifies direct labor rates and associated indirect rates.

Answer: The labor rates in G.14 are NOT to be loaded through G&A or award fee. The Indirect rates should be specified separately as shown on the chart.

Question 26. RFP G.14 - Please clarify the difference between Project Planner and Scheduler/Cost Analyst. It is our understanding that Project Planner and Scheduler are often synonymous with each other at Langley.

Answer: The definitions of these support personnel are provided in Exhibit G to the RFP.

Question 27. RFP I.1 .B - Are paragraphs (e) and (f) included in Clause 1852.242-72?

Answer: Paragraphs (e) and (f) are part of Alt II to NASA FAR Supplement Clause 1852.242-72, which deals with the Observance of Legal Holidays. LaRC is still considering the inclusion of Alternate II and the Final RFP will reflect our decision.

Question 28. RFP I.13, Security Classification Requirements (NASA 1852.204-75) (SEP 1989) Our company already posses Top Secret facility and personal clearances. Will we be required to establish our own Top Secret facility clearance at Langley? If not, will the Government provide the Top Secret facility for storage and use of classified materials?

Answer: A Langley unique Top Secret facility clearance is not required. All storage and use of classified materials will be done by NASA Langley.

Question 29. RFP Exhibit A, DD 254 and Exhibit B, Contract Documentation Requirements. The DD 254 specifies Operations Security requirements, but the Exhibit B, the contract documentation requirements, does not specify an OPSEC Plan. Should an OPSEC Plan be added as a contract deliverable?

Answer: An OPSEC Plan is not required. The DD254 will be updated and included in the final RFP.

Question 30. RFP Exhibit B, Contract Documentation Requirements, and Exhibit E, Draft Award Fee Evaluation Plan Exhibit B specifies the Self Assessment Report be delivered 30 calendar days after completion of the evaluation period. Exhibit E specifies the Self Assessment Report be delivered 25 days after the end of the period. Which is correct?

Answer: The self assessment report shall be delivered 25 days after the end of each evaluation period. This change will be reflected in the final RFP.

Question 31. RFP Exhibit E, Draft Award Fee Plan Part III.C (Cost Analysis No. 1) This paragraph seems to have a wording problem. It is stated that if the percentage of tasks having Task Order Actual Costs that fall below 105% of the Task Order Planned Costs falls below 61% of tasks then the Award Fee score will be 0. It would appear that it is desirable for task costs to fall below 105% of the Task Order Planned Cost. Please clarify the wording and intent of this paragraph.

Answer: The last sentence under **Cost Analysis No. 1** which reads: "If the percentage of Tasks falls below 61 than the numerical score will be zero(0) for Cost Analysis 1," will be deleted from the Award Fee plan.

Question 32. RFP L.13.E - Technical Proposal Volume I:

(a) The DRFP does not require resumes for proposed Key Personnel. Is this intentional? If resumes are desired are they to be included in the Volume I 75-page limitation? Will the Government specify the desired contents of the resumes?

(b) Will key personnel resumes be evaluated? If so, please provide the evaluation criteria in Section M of the final RFP.

Answer: The Government does not plan on evaluating resumes or key personnel as part of this procurement.

Question 33. RFP L.13.E.1.b, Subfactor 2 – Management and Staffing - The first paragraph states that contract award is 1 November 2000 and contract effective date is 1 January 2001. To clarify, does this mean a 60 day transition overlapping the incumbent contractors' performance?

Answer: A 60-day transition period is planned; however, the actual work on Task Orders will not begin until January 1, 2000.

Question 34. RFP L.13.E.1.b Subfactor 2 – Management and Staffing - Since our Quality System Manual and associated procedures already address our approaches to contract and task management as well as other administrative functions, and they will be provided as attachments to Volume I, can they be incorporated by reference into our response to this subfactor?

Answer: No, an official response to this subfactor is required within the 75-page limitation.

Question 35. RFP L.13.F.1.3.e and G.12.C - These paragraphs state that offerors are to propose ADP equipment, general purpose equipment, machine tools and vehicles for the entire contract. We are concerned that the requirement to provide ADP and other equipment gives the incumbent contractors an unfair competitive advantage. Since they are allowed to purchase such equipment under their current contracts (as direct or indirect costs) they can reduce their proposed SAMS indirect costs by purchasing large numbers of computers now and then not proposing such costs in their SAMS offers. It is our understanding that at least one of the incumbents is in fact doing this. We strongly recommend the Government provide a fixed cost for all offerors to propose for ADP equipment, tools and other equipment to ensure that the incumbents do not have a competitive cost advantage.

Answer: Since the Government currently provides all equipment under the current contracts, it is unclear how the incumbents can have an unfair competitive advantage in this area. Therefore, the Government will not provide a fixed cost for all offerors to propose ADP equipment, tools and other equipment.

Question 36. Paragraph G.12 .C states that contractor supplied ADP equipment and software shall be compatible with the Langley Organization supported. Please provide a list of current ADP equipment and software being used by SAERS and ARTS contractor personnel. We need specific information on types and quantities of computers, software packages and number of users (for costing site licenses), and any other special ADP hardware required. In order to cost the number of printers and other shared peripherals required we need to know how the staff are distributed across the Center (i.e., how many persons can reasonably share a printer or other peripheral device?)

Answer: The nature and magnitude of ADP equipment and software that is currently being provided by the Government can be determined by reviewing the contracts and task orders contained in the Bidders Library. Additional information regarding the distribution of staff to assist you in preparing cost proposals will be provided in the final RFP.

Question 37. RFP L.13.F.1 The second paragraph states that the SAMS contractor may use the Langley ODIN Contractor services for ADP equipment and software. Since the first paragraph states that we must "clearly identify where these costs are considered in their proposal", please provide the Langley ODIN seat costs for equipment anticipated to be used by the SAMS successful offeror. The ODIN web site did not give sufficient information to meet pricing requirements. In the absence of ODIN cost data we suggest that the Government provide a fixed cost for all offerors to propose for ADP equipment and that appropriate revisions to the cost be allowed after the Code R ODIN award is made.

Answer: The LaRC ODIN seat costs are presently unavailable as a Contractor has not been selected. However, the seat costs from other NASA Centers are publically

available. The Government will not provide a fixed cost for all offerors to propose ADP equipment, tools and other equipment.

Question 38. RFP M.2.A.1 Subfactor 1 – Understanding the Requirements
This paragraph states that "The offeror's correlation of his expertise and that of significant subcontractors or teaming partners in each of the broad functional areas of the Statement of Work will be evaluated." Please clarify what is meant by "correlation of expertise".

Answer: The instructions contained in Section L.13 of the RFP are provided in sufficient detail for offerors to provide an adequate response to the area in question.

Question 39. Rate Chart -The Rate Chart is void in Excel Workbook. Will it be identical to the one in G.14?

Answer: The sheet entitled "Rate Chart" is there to provide a single place to display all rates, factors, and assumptions that are used in the Cost Form formulas. The use of the "Rate Chart" sheet is optional

Question 40. Cost Form C - Since many companies hold their benefits costs as proprietary information, is a note referencing their disclosed cost proposal acceptable to comply with Note 1?

Answer: Reference RFP Section L, paragraph L.13.F.1.c, subcontractors may submit proprietary cost information directly to the Government. Cost Form C, Note 1, requires that subcontracted categories be annotated. Thus, subcontracted and prime costs would then be supported separately.

Question 41. It is not possible to provide fixed numbers for the costs associated with some components of the fringe portion of an overhead pool since there are many variable elements such as:

(1) the company contribution to many 401(k) and "company pension plans" is a function of the employee's contribution.
(2) the amount of paid absence for all positions (Wage Determination included) is a function of service time.
(3) Civic Duty (Military, Jury) time is an overhead component and highly variable.

Is it acceptable to use averages used to establish Forward Pricing Rates Agreements for such variable quantities?

Answer: These elements are a part of your Defense Contract Audit Agency (DCAA) approved indirect rates. They are not expected to be derived separately for each category, but applied to each as an average apportionment of the total rate.

Question 42. Are the formulas requested in Note 2 to be annotated as text on the spreadsheet as well as explained in the text of the Business Proposal?

Answer: Formulas in spreadsheets should be self explanatory when supported by rationale in the text of the Business Proposal.

Question 43. Is an overhead cost element sheet used for justification for a FPRA acceptable to Comply with Note 4 for the "Other" elements since that is a required element of the Business Proposal? Or, should columns be added that sum into the "Other" column?

Answer: An explanation of elements in "Other" is adequate. Additional columns are not a requirement.

Question 44. Should rows for each subcategory classification (I - V) be added so as to provide the detail of Year 1 Payroll Tax and Fringe Benefit costs for each direct labor position?

Answer: The Cost Forms should reflect the weighted composite hourly labor rates and total category hours. Your spreadsheet must show how each rate was derived. There must be sufficient detail for the Government to evaluate the subcategory I-V labor rates, and verify the hours to the RFP.

Question 45. Cost Form B - This format provides for one category level per direct labor classification. Should rows for each subcategory classification (I - V) be added so as to provide the detail of productive hours and direct labor cost for each category classification?

Answer: The Cost Forms should reflect the weighted composite hourly labor rates and total category hours. Your spreadsheet must show how each rate was derived. There must be sufficient detail for the Government to evaluate the subcategory I-V labor rates, and verify the hours to the RFP.

Question 46. RFP L.13.B.2 stipulates that the proposal shall use "not smaller than 12 point type." It is easier to compose, read and evaluate figures and tables prepared using 9-point type. Please indicate the Governments willingness to accept figures and tables prepared using 9-point type?

Answer: 8-point font or higher is acceptable for graphics and tables provided that it is legible. This change will be reflected in the final RFP.

Question 47. The Research Test Pilots referenced in Exhibit G, Direct Labor Classification Descriptions is not mentioned in the SOW.

Answer: The Research Test Pilots may be required in individual Task Orders. The nature of work is defined in Sections 4.3 and 7.0 of the Statement of Work.

Question 49. **Page 13, G.1, AWARD FEE FOR SERVICE CONTRACTS (FAR 1852.216-76) (MAR 1998), (f)(1) and (2) through (4):** Paragraph G.1(f)(1) states that provisional award fee payments will not be made under the contract. However, Paragraphs G.1(f)(2) through (4) describe the process by which provisional award fee payments will be made. Please clarify the Government's intent as it relates to provisional award fee payments.

Answer: Considering the award fee pool will not be finalized until the end of each 6-month evaluation period, provisional fee payments will not be made under this contract. However, any proposed methodologies on provisional fee payments submitted on or before May 5, 2000 will be considered by the Government.

Question 50. **Pages 16, 19, & 89, deal with GFE**, Contractor supplied ADP equipment and software, and ODIN possibilities, but we would appreciate a statement of NASA's expectations. In particular, what will be the status of GFE currently in the possession of the incumbent contractors?

Answer: GFE in the possession of the current Contractors will not be made available under the SAMS procurement unless the conditions stated in Question 6 hold true. The nature and magnitude of ADP equipment and software that is currently being provided by the Government can be determined by reviewing the contracts and task orders contained in the Bidders Library.

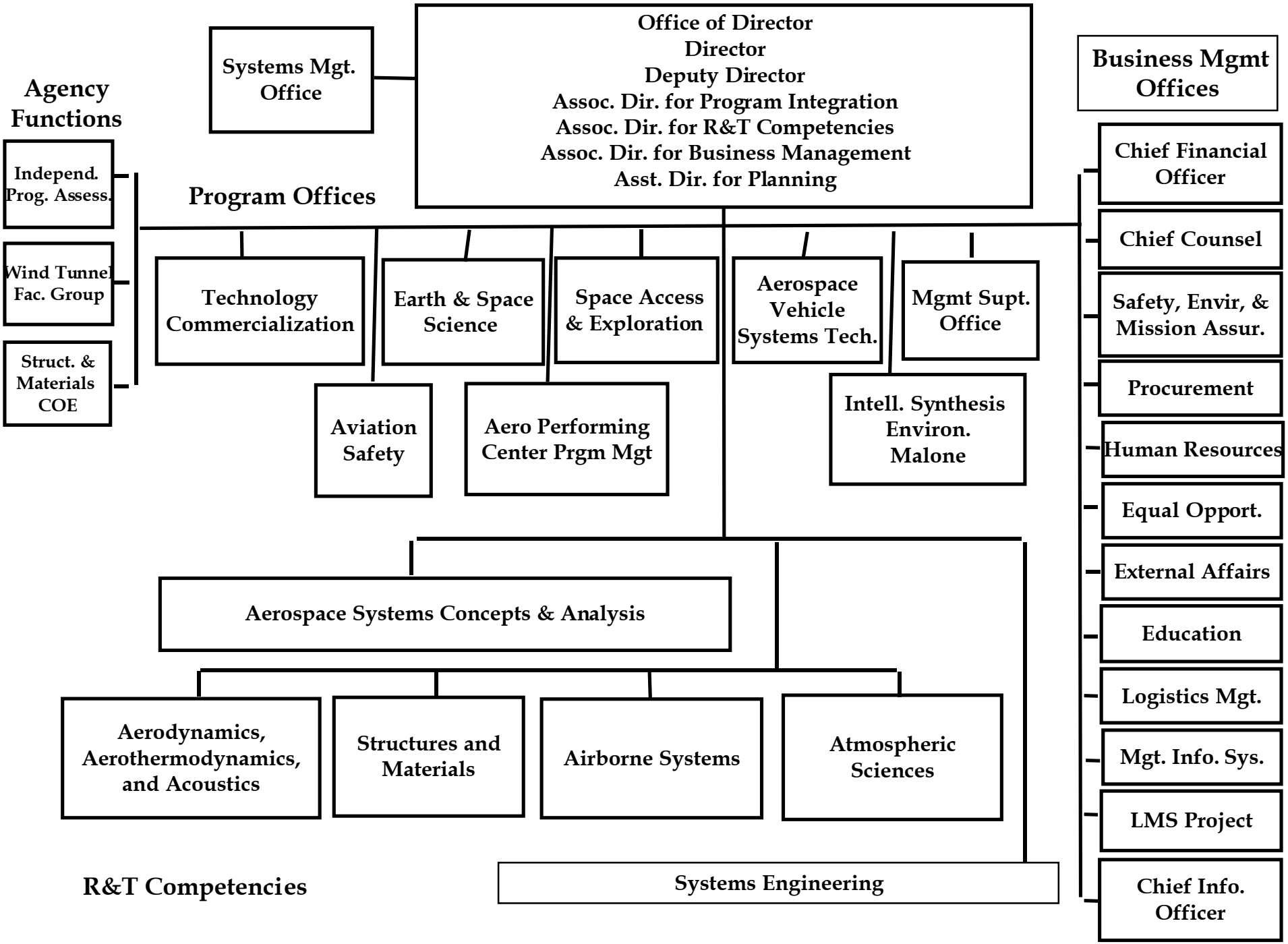
Question 51. **Exhibit E - Award Fee, Under Cost Analysis No. 1 there is the statement "If this percentage of tasks falls below 61 then the numerical score will be zero for Cost Analysis 1." Question:** Of the 25% allotted for cost evaluation how much is for Cost Analysis No 1 and how much is for Cost Analysis No 2?

Answer: Both Cost Analysis defined in the Award Fee Plan will be used as data points to assist the Award Fee Evaluation Board (AFEB) in the evaluation of the Cost Factor. The final score; however, will be determined by an subjective assessment of the Board. The statement in question will be deleted from the Award Fee Plan.

Systems Engineering Competency

Glenn R. Taylor

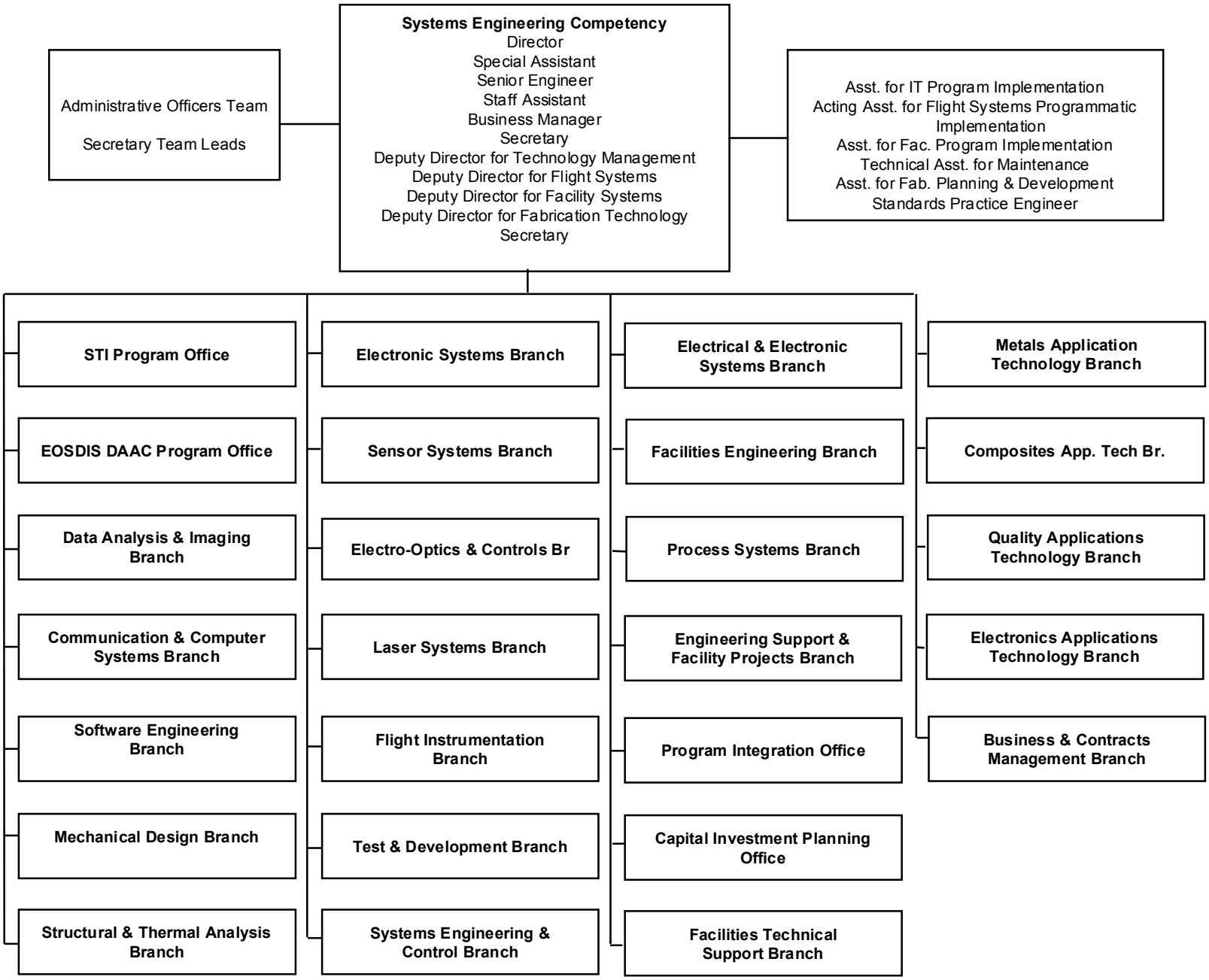
April 25, 2000



Revised 10/99

SEC Areas of Expertise

- Flight Aerospace Systems Development
- Information Technology
- Fabrication Technology Development
- Aeronautical and Space Research Facility Systems


Administrative Officers Team
Secretary Team Leads
Systems Engineering Competency
Director
Special Assistant
Senior Engineer
Staff Assistant
Business Manager
Secretary
Deputy Director for Technology Management
Deputy Director for Flight Systems
Deputy Director for Facility Systems
Deputy Director for Fabrication Technology
Secretary
Asst. for IT Program Implementation
Acting Asst. for Flight Systems Programmatic Implementation
Asst. for Fac. Program Implementation
Technical Asst. for Maintenance
Asst. for Fab. Planning & Development
Standards Practice Engineer
STI Program Office
EOSDIS DAAC Program Office
Data Analysis & Imaging Branch
Communication & Computer Systems Branch
Software Engineering Branch
Mechanical Design Branch
Structural & Thermal Analysis Branch
Electronic Systems Branch
Sensor Systems Branch
Electro-Optics & Controls Br
Laser Systems Branch
Flight Instrumentation Branch
Test & Development Branch
Systems Engineering & Control Branch
Electrical & Electronic Systems Branch
Facilities Engineering Branch
Process Systems Branch
Engineering Support & Facility Projects Branch
Program Integration Office
Capital Investment Planning Office
Facilities Technical Support Branch
Metals Application Technology Branch
Composites App. Tech Br.
Quality Applications Technology Branch
Electronics Applications Technology Branch
Business & Contracts Management Branch

Systems Engineering Competency Program/Project Roles

- **Techology Commercialization Program**
- **Earth & Space Sciences Program Office**
  - NAST-1
  - CERES
  - SAGE III
  - EOS Algorith Dev & Ops
  - Reflected GPS
  - GEOTRACE/GIFTS
  - PICASSO CENA
  - SOLVE
  - EOSDIS DAAC
  - Cross Enterprise Sp Tech
  - Timed SABER
- **Space Access & Exploration Program Office**
  - GEOLAB
  - SEEP
  - Hyper X
  - RLV Focused Technology
  - Mars Surveyor Adv Planning

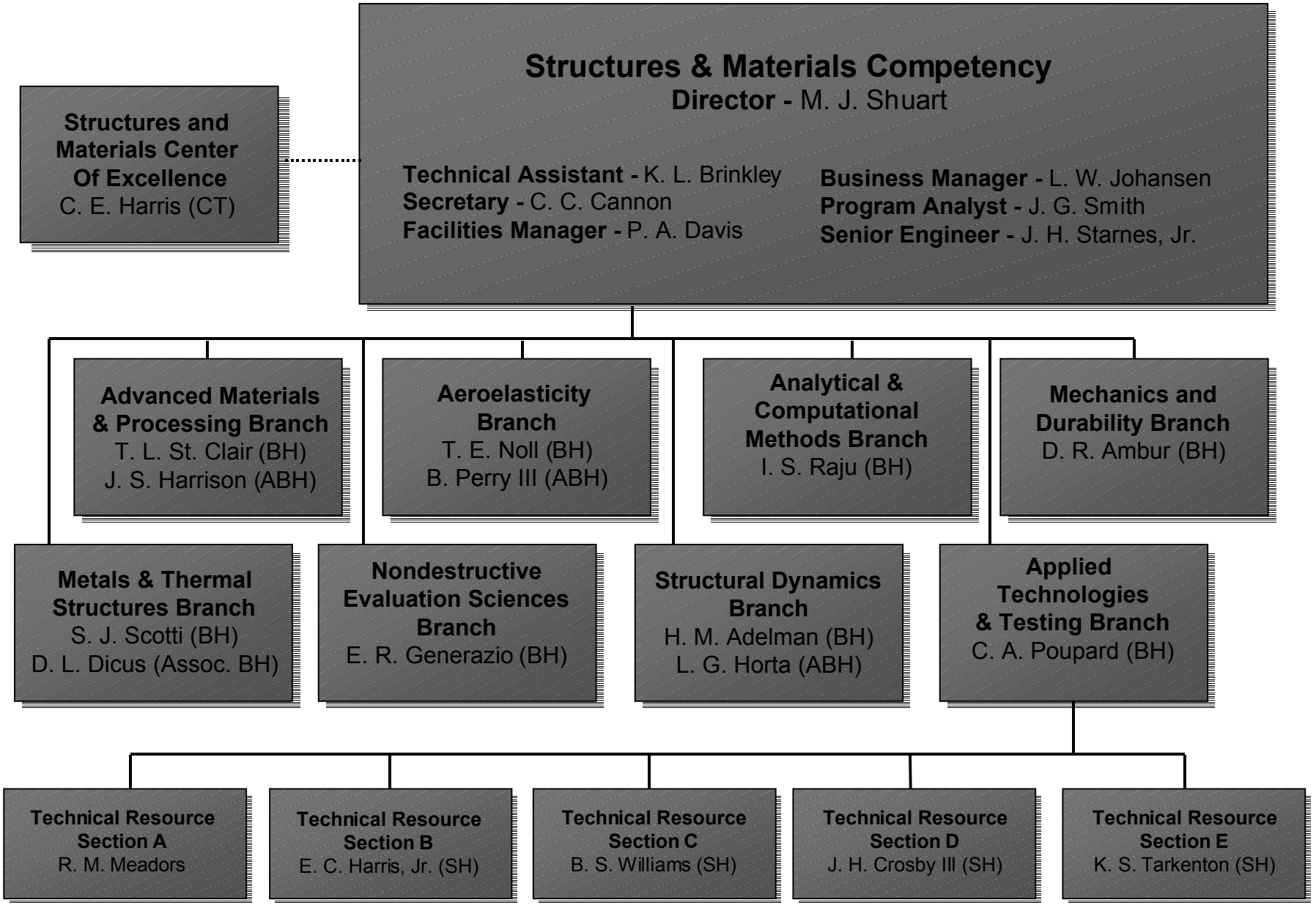
Systems Engineering Competency
Program/Project Roles

- **Aerospace Vehicle Systems Technology Program Office**
  - Aeronautics R&T Base
  - Aerospace Vehicle Systems Technology
- **Aviation Safety Program Office**
  - AFD Cockpit Development
  - Aviation Safety Technology Program
- **Intelligent Synthesis Environment Program Office**
- **Aero Performing Center Program Office**
  - Aviation System Capacity
  - Blended Wing Body
  - Integrated Information
  - R/C Aerodynamics
  - Ultra-Efficient Engine Technology
  - HPCC Computational Aerospace Science
- **Atmospheric Science**
  - Laser Research
  - Advanced Sensors
  - Software Development and Integration

Contract Role

- SAERS Supported SEC Through App. 64 Tasks

- Representative Engineering Efforts Included:
  - Mechanical Design
  - Electronic Design
  - Thermal Design & Analysis
  - Sensor System Design, Development & Operations
  - Software System Development & Test
  - Instrumentation Systems
  - Detector & Laser Development



[Chief Technologist (CT); Branch Head (BH); Assistant Branch Head (ABH); Section Head (SH)]

Areas of Expertise

AoE 1. Develop advanced **materials and processing technologies** to enable the fabrication of low-cost and high-performance structural concepts for aerospace applications.

AoE 2. Conduct research and technology development that accurately and efficiently predict **behavior, durability and damage tolerance,** evaluates **concepts, and validates** performance of advanced materials and structures for aerospace structural applications.

AoE 3. Conduct research and technology development for advanced **sensors, intelligent systems, and ground operations** to ensure structural integrity, reliability, and safety for aerospace vehicles.

AoE 4. Conduct research and technology development to quantify and control **aeroelastic response, unsteady aerodynamic** flow phenomena, **and structural dynamics** behavior for aerospace vehicles

Areas of Expertise (cont.)

AoE 5. Design and conduct innovative structures and materials **experiments** to identify unique phenomena, interrogate new theories, and quantify material and structural behavior **using complex research facilities and equipment safely** .

AoE 6. **Lead, manage**, and provide administrative support to the organization, facilities, and programs.

Structures & Materials Capabilities

From Materials Synthesis to Large Structures Testing

Polymer Synthesis

Materials Characterzation

Structural Concepts Tests

Optical Fiber Draw Tower

Transonic Dynamics Tunnel

Landing Dynamics Test

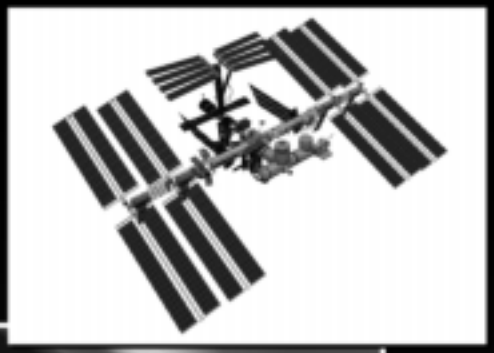
S&M Facilities

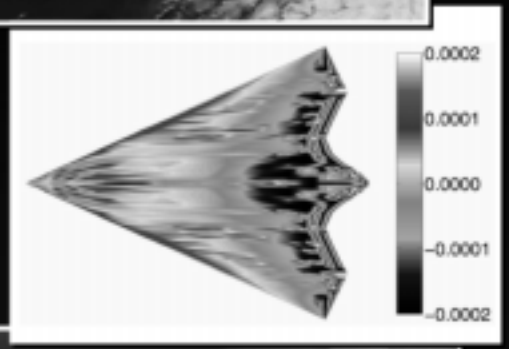
Aerospace Systems, Concepts and Analysis Competency

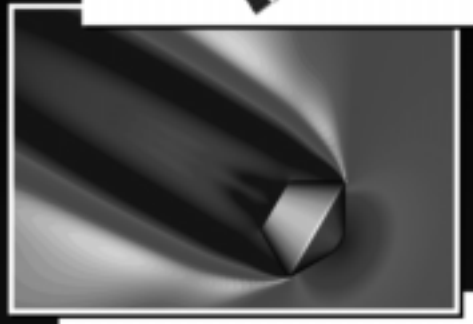
From the Runway to the Planets...

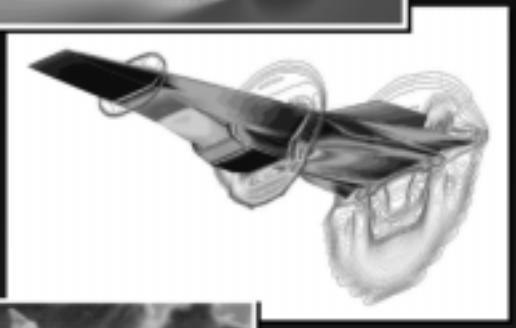
Improving Quality of Life and Enabling Exploration

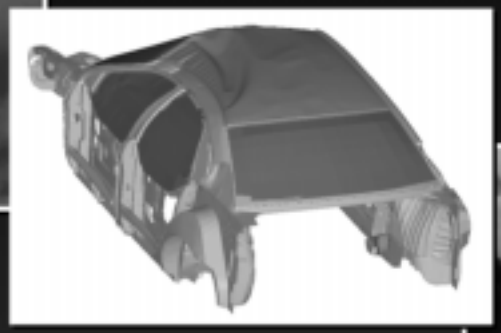
- *Technology Payoff*
- *Lower Cost*
- *Safety*
- *Environment*
- *Performance*









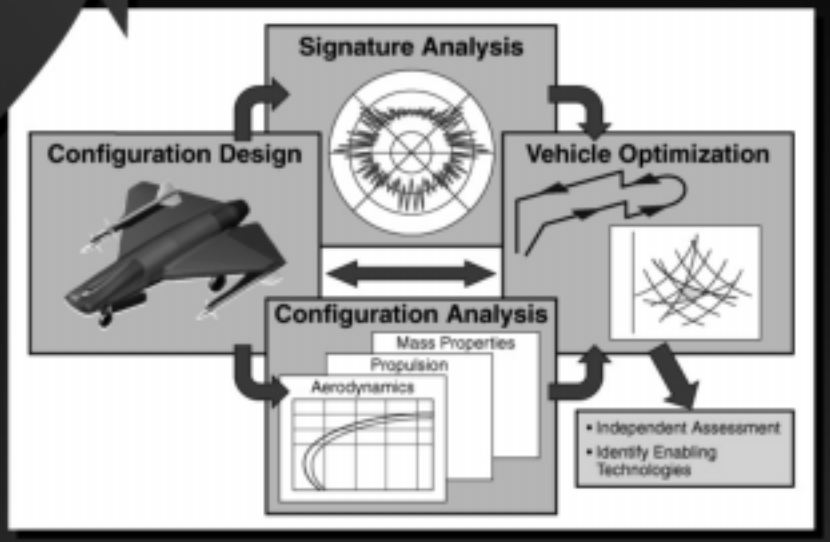


Advancing the State-of-the Art for Survivable Systems

Research and Develop New Technologies
(e.g. unmanned, high-g fighter aircraft)

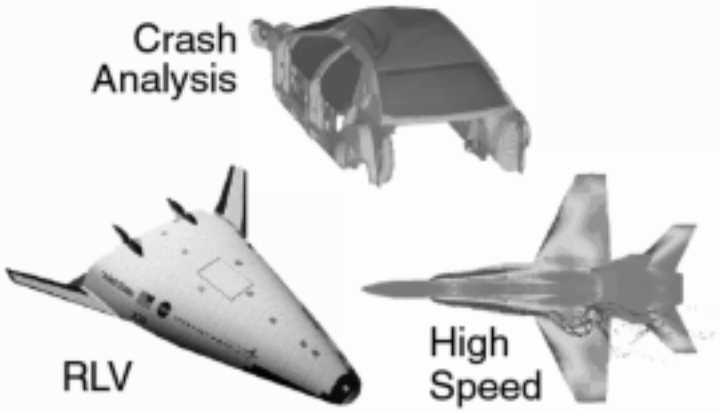
Survivability Challenges
(e.g. air-to-air superiority)

Evaluation of Technologies



Computational Aerosciences

Complex MDO Applications



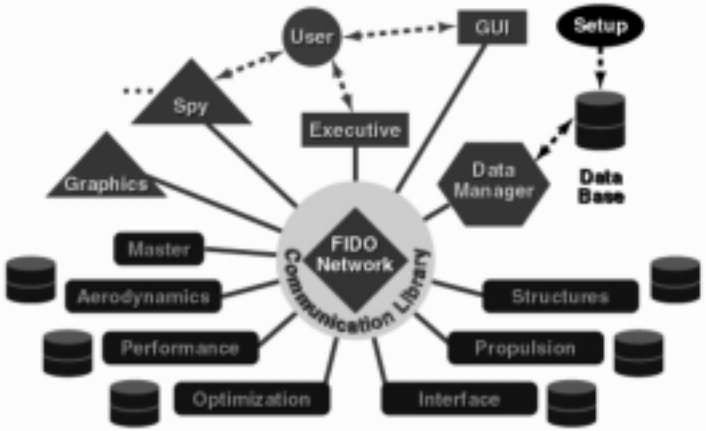
Basic Research/System Software

Learning Technologies

Educational technology to develop future scientists and engineers skilled in high performance computing

Computational Frameworks

FIDO Execution System



Advanced Methods

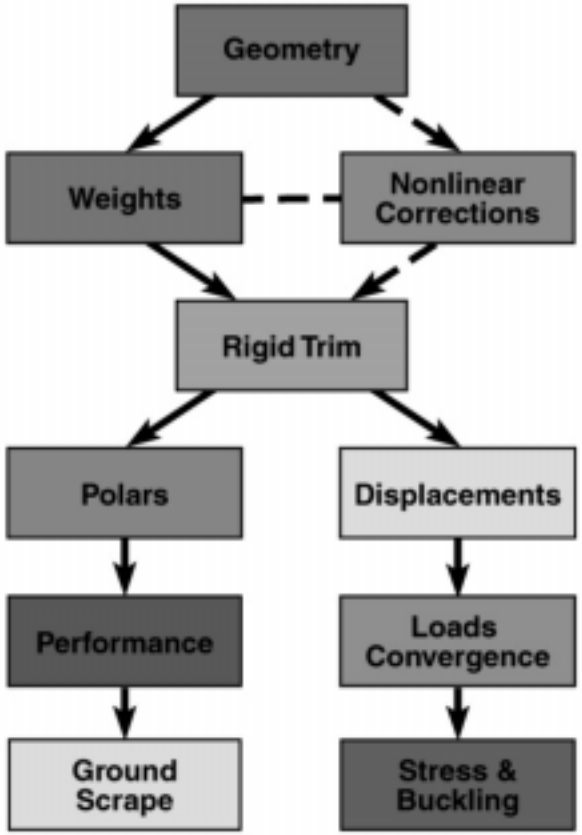
"Compute as fast as engineers can think."

Multidisciplinary Design Optimization

Charter: develop MDO methods to increase design confidence and to cut development time

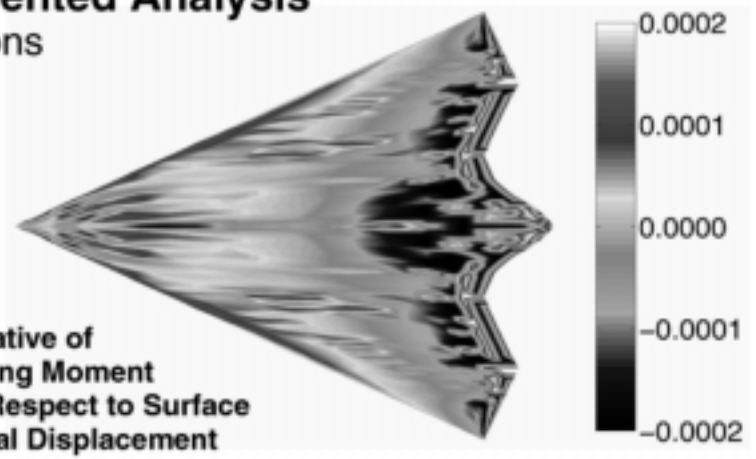
Multidisciplinary Optimization

Integration Methods
Optimization Methods



Design-Oriented Analysis

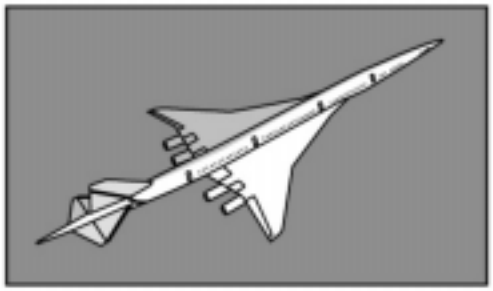
Approximations
Sensitivity



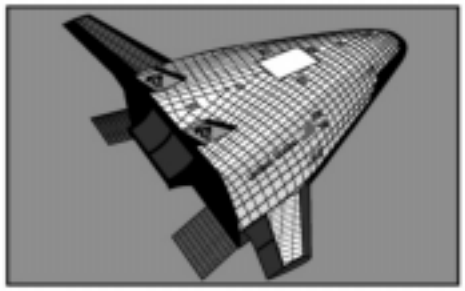
$\partial C_M/\partial z$: Derivative of Pitching Moment with Respect to Surface Normal Displacement

High-Fidelity Applications

Aeronautics

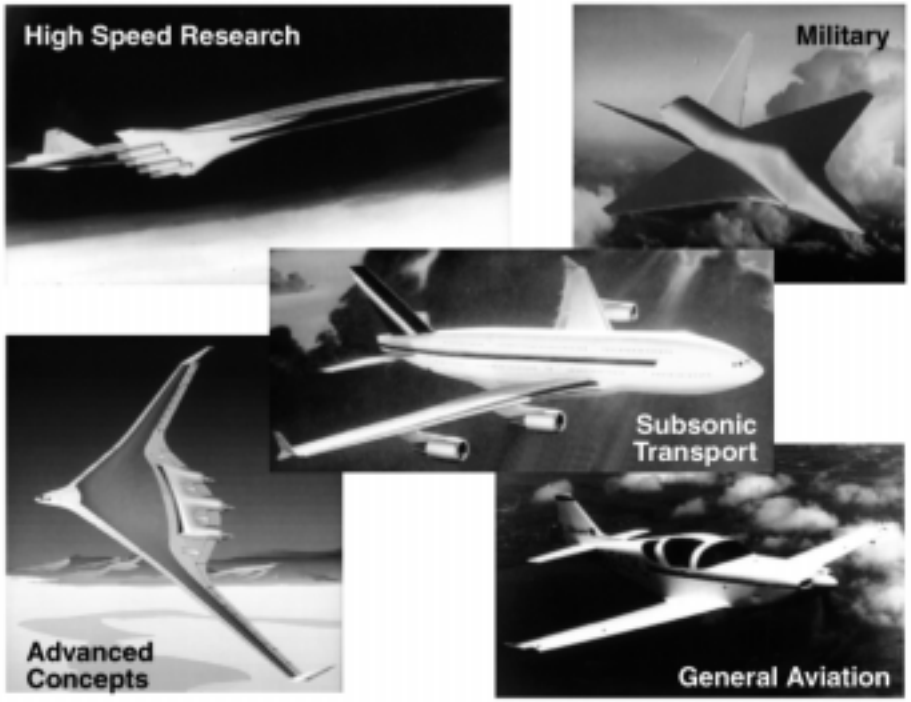


Space



Advanced Civil Airplane & Transportation Systems Analysis

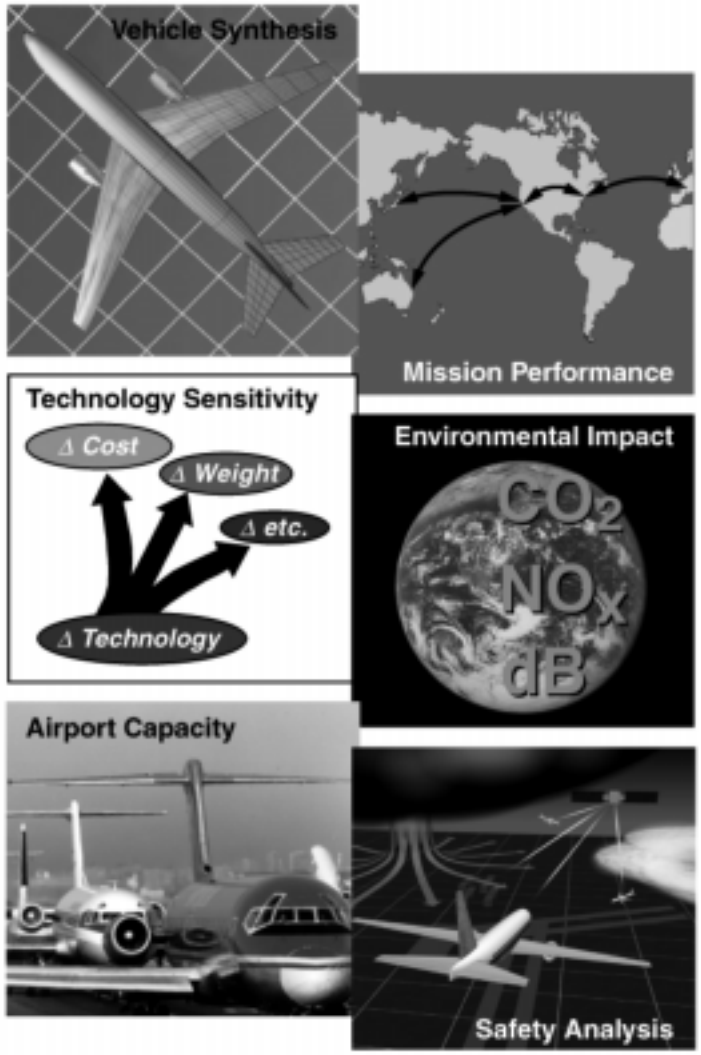
Aircraft Systems Analysis



Aeronautics Systems Analysis Tools

Aircraft Synthesis and Optimization (FLOPS)/(ACSYNT)
Aviation System Analysis Capability (ASAC)
Aircraft Life Cycle Cost Analysis (ALCCA)
NASA Cost Benefit Analysis (NACBA) Tool

Transportation Systems Analysis



Space Mission Analysis

Advanced
Systems
Software
Development

GRACE

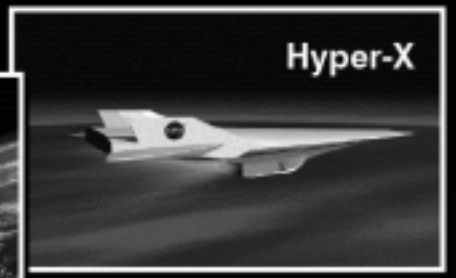
GPS Ocean
Bounce

International
Space Station
Evolution and HEDS
Systems Analysis

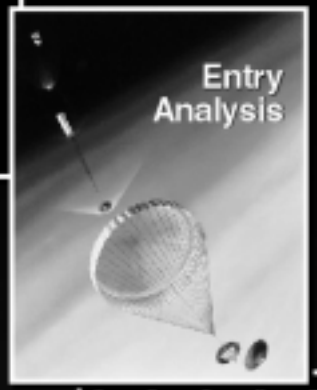
RLV Crew &
Logistics Carriers
for the ISS

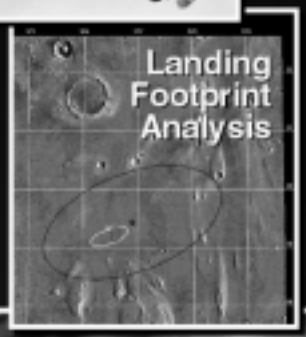
Vehicle Analysis

Space Transportation



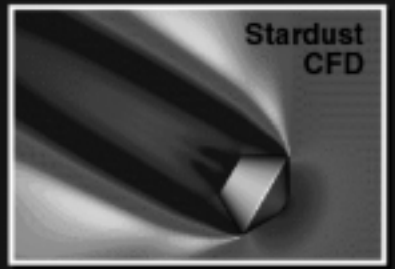
Planetary Exploration





- *Define and assess advanced system concepts*
- *Assess technologies/identify technology requirements*
- *Design, validate, and assess flight systems*
- *Develop analysis tools and methods*

Analysis Capability Development



HYPERSONIC AIRBREATHING SYSTEMS

presented by

Charles R. McClinton
Technology Manager
Hyper-X Program Office

to the

Systems Analysis and Mission Support
(SAMS)
Pre-Proposal Conference
April 25, 2000
NASA Langley Research Center

HYPERSONIC AIRBREATHING SYSTEMS

Objective:
Develop world-class hypersonic technology

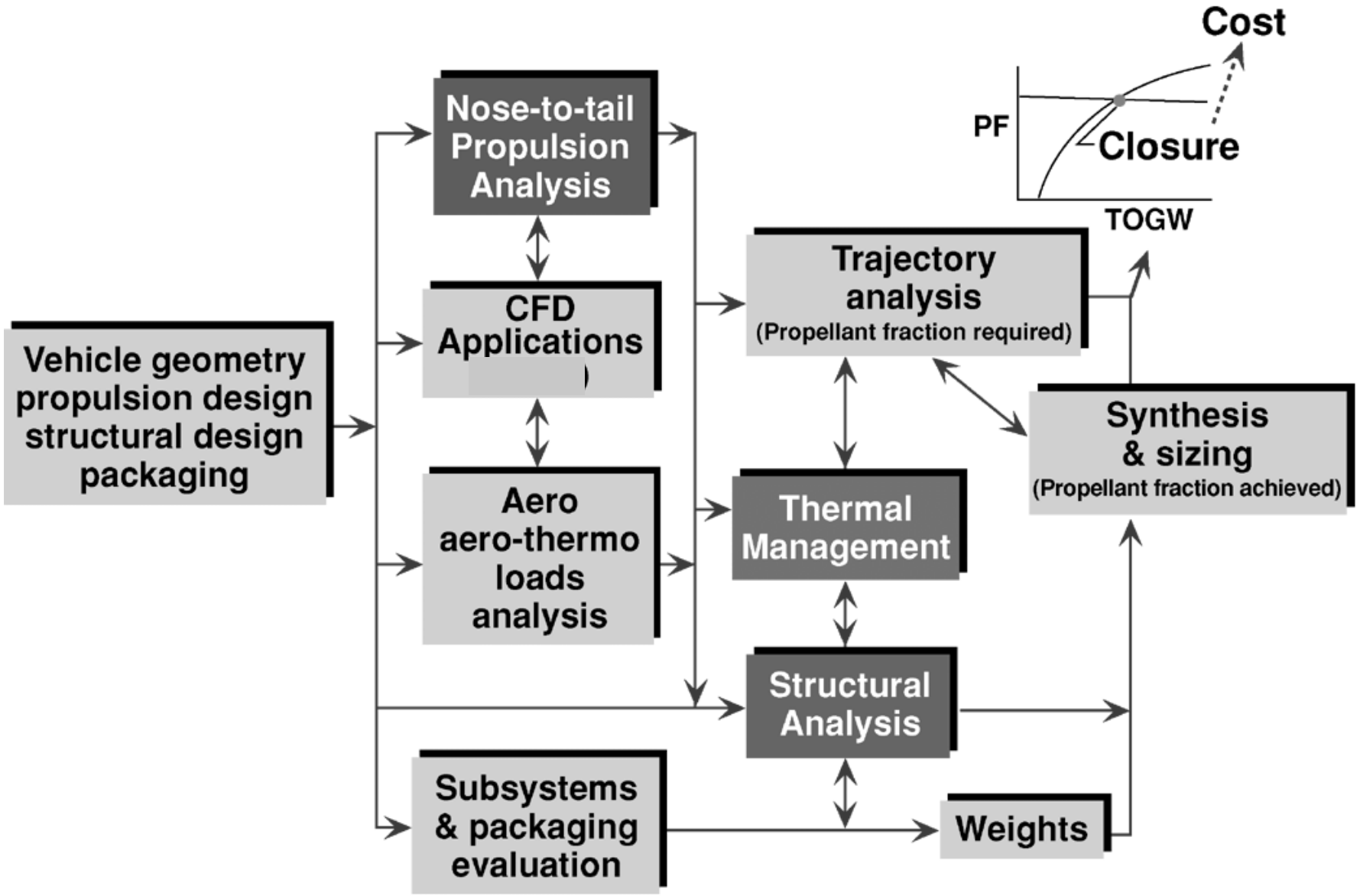
- Integrated hypersonic airbreathing systems analysis, design and evaluation
- Scramjet flowpath and engine analysis and design
- Method development and validation
- CFD applications

HYPERSONIC AIRBREATHING SYSTEMS

Focus

- **Hyper-X (LaRC)**
  - X-43 design
  - Flight test risk reduction
  - Methods validation
  - Follow on flight test vehicle design
- **Spaceliner (MSFC)**
  - Vision vehicle design
  - RBCC (Rocket based combined cycle) and
  - TBCC (turbine based c_ c_) engine technology
  - Flight test vehicle(s) conceptual design

VEHICLE DESIGN / ANALYSIS PROCESS



VISION VEHICLE FIDELITY

Color Code	Propulsion	Aero	Structure Weight	Vehicle Performance	Synthesis & Packaging
Blue	Flight Data	Flight Data	Flight Vehicle	Flight Vehicle Performance	Flight Vehicle
Light Blue	Wind Tunnel Data	Wind Tunnel Data	Components Fab/Test	6-DOF Hardware Simulation	Mock-up, CAD Multi-Eqn. Non-linear
Green	CFD Certified	CFD Certified	FEM Certified	3-DOF/ 6 DOF Trimmed	CAD Multi-Eqn. Non-linear
Light Green	Cycle Certified	Engineering Methods Certified	Unit Loads Certified	3-DOF Trimmed	CAD Multi-Eqn Non-Linear
Yellow	CFD Uncertified	CFD Uncertified	FEM Uncertified	3-DOF untrimmed	Single Eqn., Non-linear
Light Yellow	Cycle Uncertified	Engineering Methods Uncertified	Unit Loads Uncertified	Energy State	Single Eqn. Linear
Red	Ideal Cycle	L/D, Cd Estimated	Design Tables	Rocket Equation	Estimated

HYPER-X PROGRAM GOAL AND OBJECTIVES

Goal

– Demonstrate and validate the technology, experimental techniques, and computational methods and tools for design and performance predictions of a hypersonic aircraft with an airframe-integrated dual-mode scramjet

Objectives

– First ever free-flight demonstration of an airframe-integrated scramjet

– Verification of computational predictions, analysis and ground test methodologies

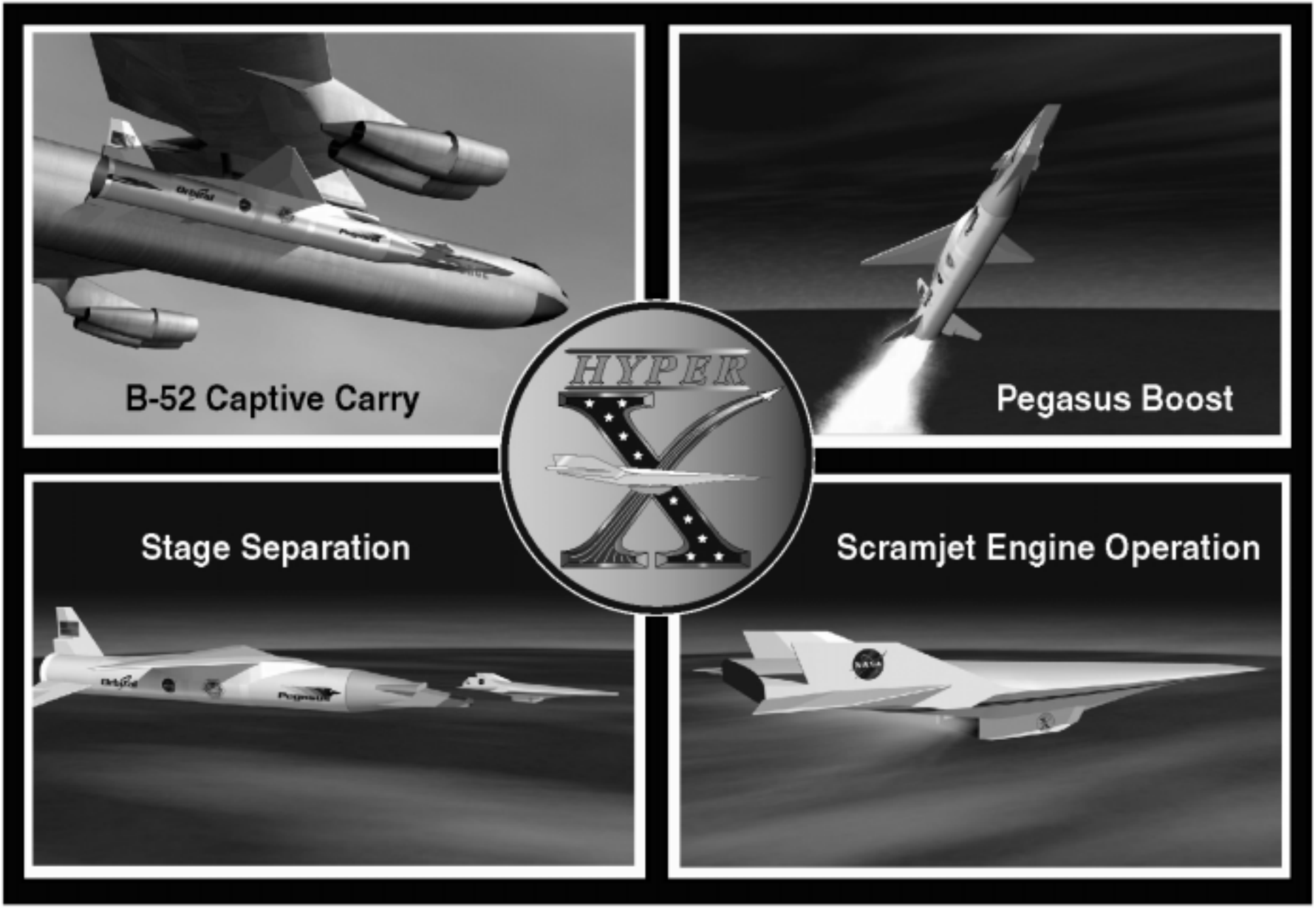
– Scaling of design concepts to future operational air-breathing hypersonic cruise and space access vehicles

Approach: Two-phase, flight-focused program

– Phase I: airframe-integrated, dual-mode scramjet
  - Three 12-foot, autonomous, expendable test vehicles
  - Two Mach-7 flights, one Mach-10 flight

– Phase II builds on Phase I results: a larger-scale, reusable X-plane
  - Airframe-integrated, combined-cycle propulsion
  - Flight envelope expansion from takeoff through hypersonic speeds

HYPER-X RESEARCH VEHICLE KEY MISSION EVENTS



I/HXRV MSSN EVNTS/McClinton

HYPER-X: Design[1]

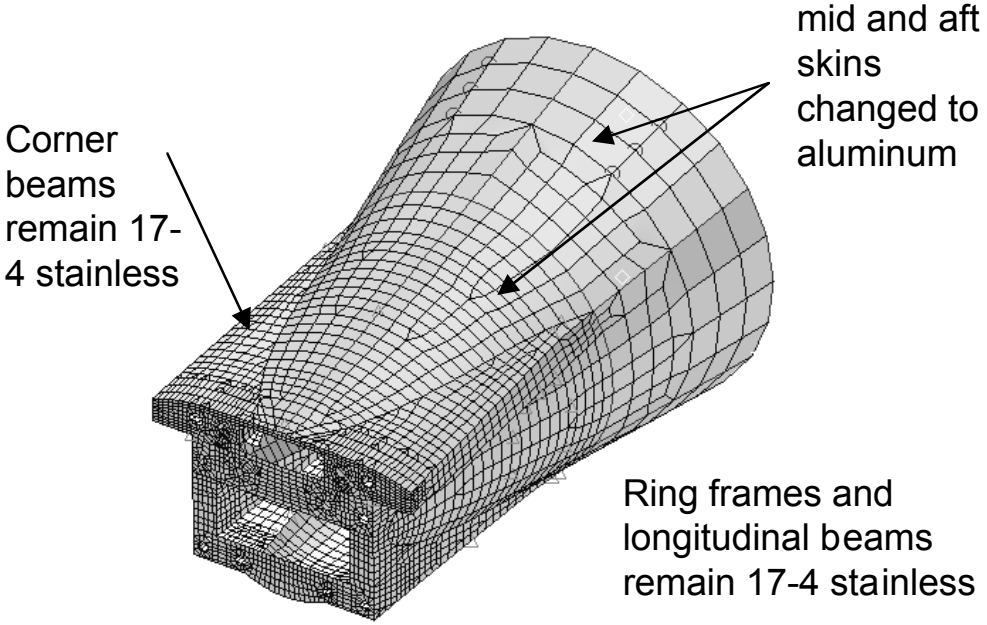
SAERS Contractor Deliverables

- Engine preliminary structural design
- Aerodynamic and aerothermal database
- Aero loads
- NASTRAN and PATRAN models
- Stage separation models
- Trajectories
- CFD analysis

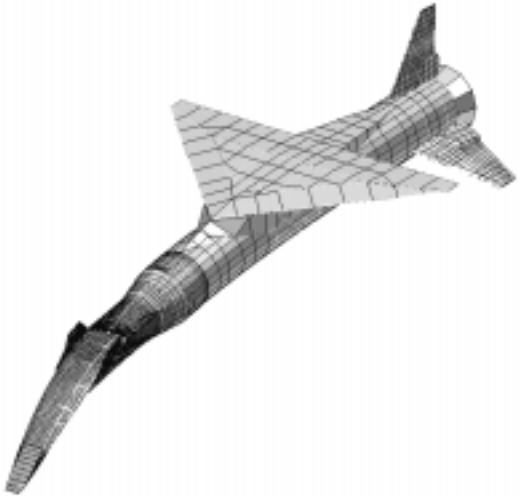
[1] Expect Mach 10 vehicle design completion in CY00

MACH 10 ADAPTER WEIGHT REDUCTION STUDY

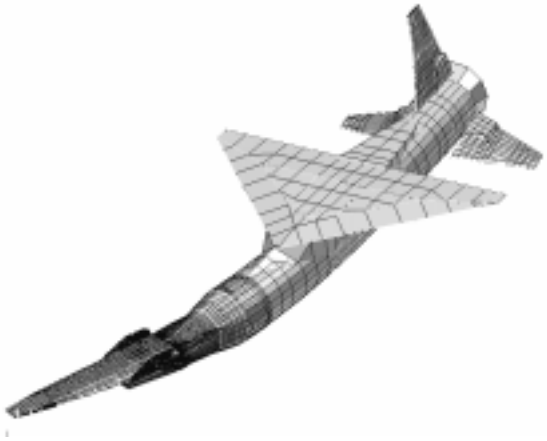
Modifications to Mid and Aft Section Skins



HXLV First Pitch Bending Mode



HXLV First Yaw Bending Mode



: HXLV Bending Frequencies for Finite Element Models

Model	Pitch Bending Frequency (Hz.)	Yaw Bending Frequency (Hz.)
Mach 7 HXLV	8.375	9.33
Mach 10 HXLV Model 1	8.74	9.73
Mach 10 HXLV Model 2	8.47	9.31

Model 1: system updates and geometry changes; no material changes (78 lb. weight reduction)

Model 2: system, geometry, and material changes (407 lb. weight reduction)

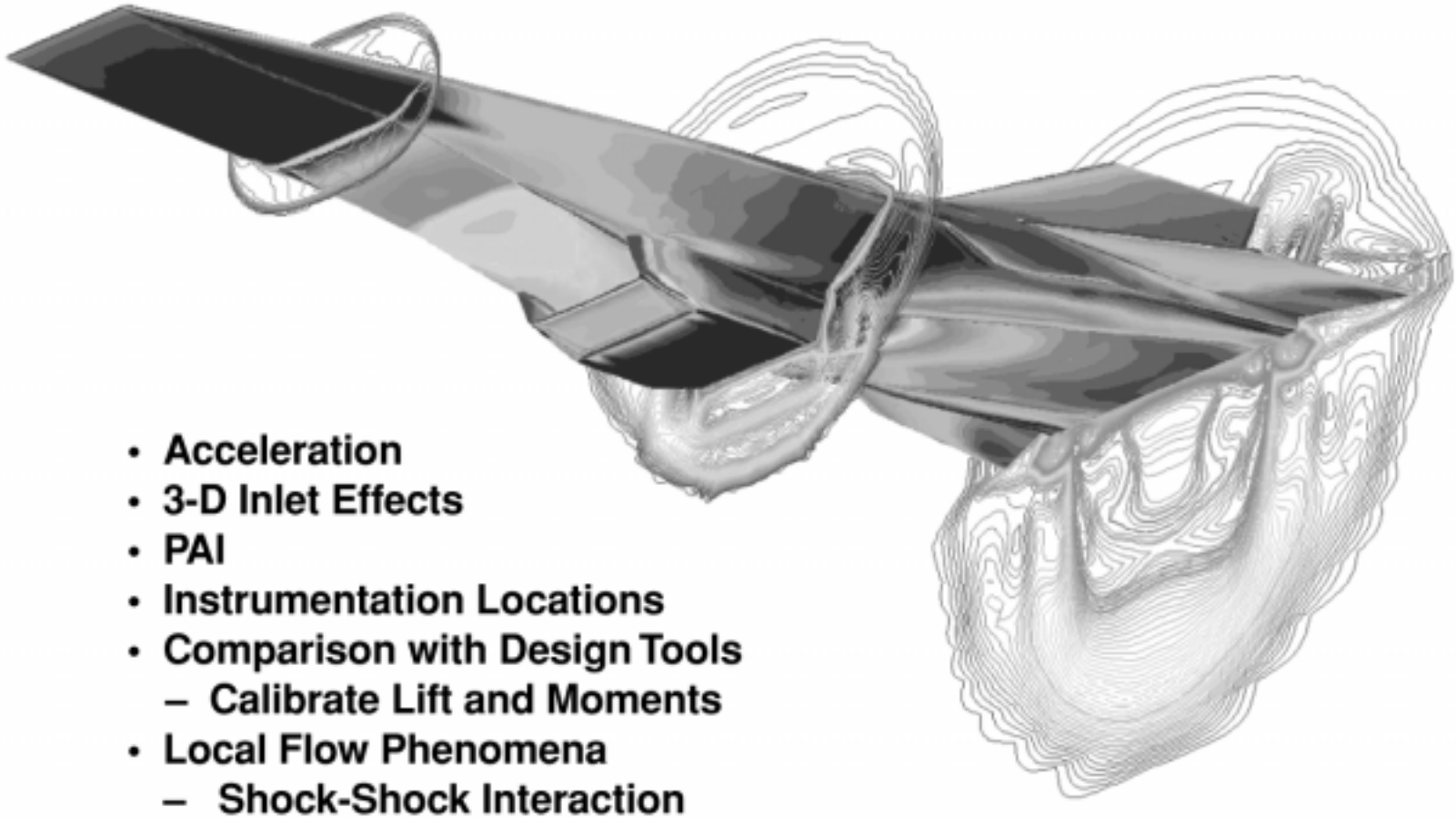
HYPER-X: Risk Reduction[1]

- **Wind tunnel data analysis/flight scaling**
  - Propulsion tests
  - Aero/aerothermal tests
  - Structural
- **Structural analysis**
- **Trajectory (Monte Carlo) analysis**
- **Detailed CFD analysis**
  - 3-D, finite rate chemical kinetics
  - Internal and external flows

[1] Mach 7 and 10 risk reduction continuing in FY 01-02.

OVERALL PERFORMANCE AND FLOW DETAILS BY GASP FNS ANALYSIS

Hyper-X Mach 7 Powered CFD Solution



- Acceleration
- 3-D Inlet Effects
- PAI
- Instrumentation Locations
- Comparison with Design Tools
  - Calibrate Lift and Moments
- Local Flow Phenomena
  - Shock-Shock Interaction
  - Base Pressure, Drag, Heating

HYPER-X: Methods Validation with Flight Data[1]

- Scramjet performance
- Structural and thermal
- Aerodynamic and aerothermal
- Aerodynamic loads
- Trajectory and stage separation simulation

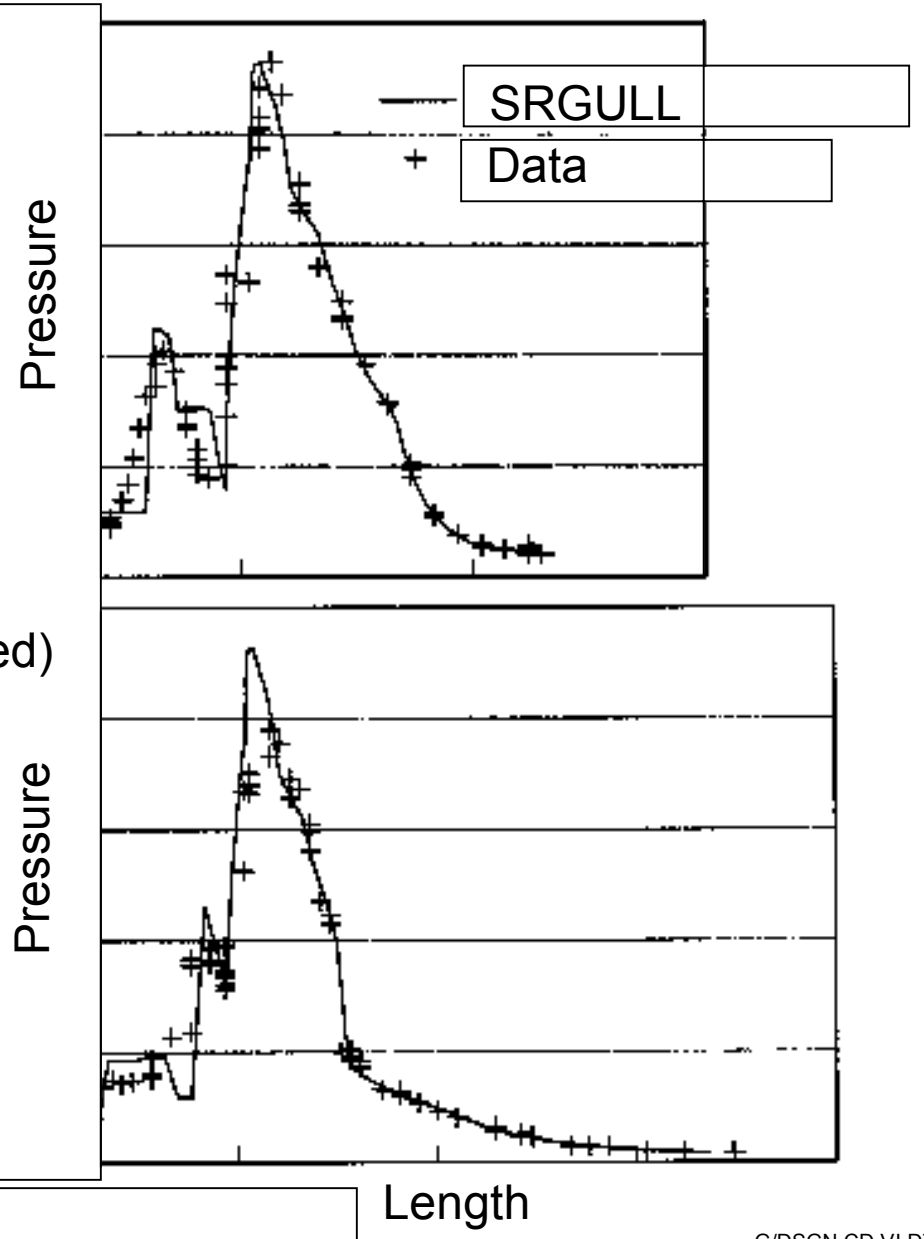
[1] Methods validation continuing in FY 01-02.

HXFE / VFS IN THE 8-FT. HTT

DESIGN CODE VALIDATION TO HYPER-X MACH 7 ENGINE DATA

- Mach 7 high power condition
- Predicted forces validated
  - Thrust
  - Lift
  - Pitching moment

  (Yaw moments being developed)
- Predicted loads validated
  - Pressure
  - Heat transfer



HYPER-X: Follow on Flight Test Vehicle Design and Technology[1]

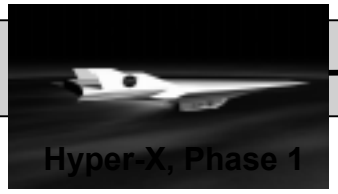
- Efficient flight test vehicle design
- Hypervelocity scramjet technology
- Turbine-based combination engine design
- Alternate propulsion cycles
- Weakly ionized gas effects
- Improved design methods
- Etc.

[1] Continuing in FY 01-02.

HYPERSONIC TECHNOLOGY DEVELOPMENT PLAN

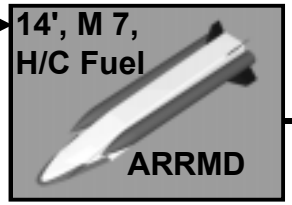
FY 96 FY 02 FY 07 FY 14

AFRL HyTech Program: H/C scramjets engines
(endothermic fuels, structures, systems)



30'; Reusable, M 4 - 7

14', M 7,
H/C Fuel



DAR PA/USAF

12'; M<<1

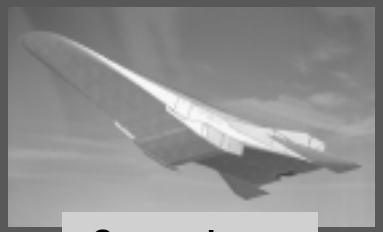
HyFLYTE RPV

X-33 Gr/Epox
X-37 Gr/Poly
LaRC IMI

45'; Reusable, M 0 – 7

Hyper-X, Phase 2

Airplanes



Spaceplanes

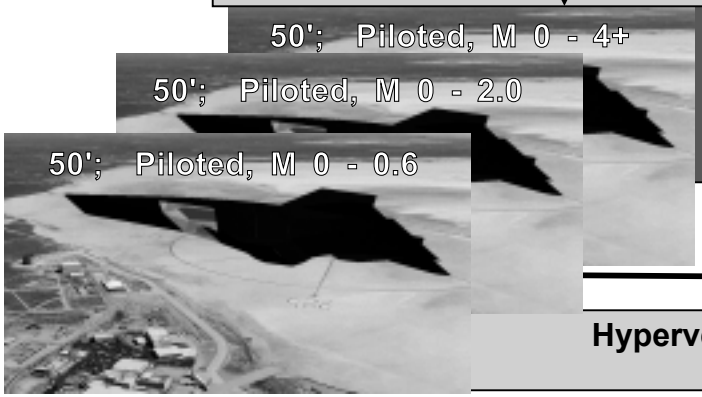
Prototype Vehicles

Revolutionary Turbine Based Engine (RTBE)
(GRC, LaRC, USN, MSFC, DFRC)

Generation 2

Generation 3

Turboramjet Scramjet Combination Engine



HLD

Hypervelocity scramjet, structures, WIG, boundary layer transition, etc.
(U.S. Army, NASA LaRC)

E C N NEW	OLD	DESCRIPTION MANUFACTURER	SERIAL NO MODEL NO	ACQ	DOC ACQ DATE	BLDG ROOM	ACQ COST
1612274		CAMERA, DIGITAL KODAK CANADA LTD	EKB73102095 DC120	B	ZCRD0688 97/09/16	NOC FE	797
138918		PRINTER, ADP NEC INFORMATION SYSTEMS	95476 PINWRITER P6	L	14777C 87/02/12	NOC HOME	512
1254749		COMPUTER, MICRO GATEWAY 2000	1292169 4DX2-66V	L	30517D 93/04/08	NOC HOME	3,368
1254977		DISPLAY UNIT SONY CORP	SSF309A10147 GDM1937	NAS 1	19468 93/05/03	NOC HOME	2,263
1255844		DISPLAY UNIT RADIUS INC	WTB310A10204 350	L	32544D 93/06/09	NOC HOME	1,943
1424004		COMPUTER, MICRO GATEWAY 2000	3034320 BABY AT	L	58036D 95/02/02	NOC HOME	2,118
1613416		COMPUTER, MICRO, PORTAB NEC CORP	9910A050 VS4C0A7D0000AD	B	ADF/0000 00/01/06	NOC HOME	2,899
1881404		COMPUTER, MICRO, PORTAB DELL COMPUTER CORP F-PC	W0XSR PPI	L	9302 99/04/28	1146 130	2,913
1881477		DISPLAY, COMPUTER, PROJ POLAROID CORP	1222 PV235	L	9453 99/05/13	1146 130	3,695
1884116		COMPUTER, MICRO GATEWAY 2000	17308039 GP7-700	B	RBG/1385 00/02/07	1200 112	2,464
1884117		DISPLAY UNIT SONY CORP	7029558 CPD520GS	B	RBG/1385 00/02/07	1200 112	948
1345267		TERMINAL AT AND T INFORMATION SY	930066B00987 DDM-PLUS	I	MISC-GODDAR 95/10/25	1201 112	5,564
1262982		COMPUTER, MICRO DELL COMPUTER CORP F-PC	3V0XC OP566	L	51501D 94/07/21	1202 114	4,682

1263431	COMPUTER, MICRO GATEWAY 2000	2481414 NEW TOWER		L 51014D 94/08/30	1202 114	4,655
1741619	PRINTER, ADP HEWLETT-PACKARD CO	USFB159498 LASERJET4+		NAS 1 19039 00/01/10	1202 114	500
140286	THERMOMETER, DIGITAL INSTRULAB INC	3323 4202-13-14-6	,	L 17565C 87/04/10	1202 117	2,394
1877806	COMPUTER, MICRO GATEWAY 2000	7956204 LP MINI DESKTO		B ZCRD0688 97/09/16	1202 123	1,994
1877807	DISPLAY UNIT GATEWAY 2000	17004A008914 GATEWAY700069C		B ZCRD0688 97/09/16	1202 123	500
1878264	POWER SUPPLY LAMBDA ELECTRONICS CORP	9712R47937 LZS750-3		B ZCRD0688 98/08/05	1202 123	1,200
1880105	COMPUTER, MICRO, PORTAB MICRON ELECTRONICS	155163-0001 NBKU375		B ZCRD0917 99/02/25	1202 123	2,493
20794	GENERATOR, FUNCTION WAVETEK SAN DIEGO INC	H90031151 21	,	L 71457C 90/03/12	1202 148	1,295
1255216	OSCILLOSCOPE TEKTRONIX INC	B031311 2232	,	L 29808D 93/06/02	1202 148	4,977
G075547	PLOTTER, GRAPHICS HEWLETT-PACKARD CO	2936A44871 7550A	,	L 76494C 90/06/01	1202 150	2,636
G076139	MULTIMETER, DIGITAL FLUKE JOHN MFG CO INC	5056279 8842A	,	L 79174C 90/07/19	1202 150	1,274
1255332	PRINTER, ADP HEWLETT-PACKARD CO	USBB148949 C2001A	,	L 35605D 93/07/16	1202 150	1,450
1255829	DISPLAY UNIT VIEWSONICS INC	4130631563 TX1713MV	,	L 33385D 93/06/07	1202 150	953
1422956	COMPUTER, MICRO DELL COMPUTER CORP F-PC	45HXD XPSP90MT	,	NAS 1 20006 94/11/14	1202 150	4,593
1613040	CAMERA, DIGITAL NIKON INC	306968 E950		B ZCRD0516 99/05/05	1202 213	1,042
1876537	COMPUTER, MICRO CTX INTL	NONE (VERIFIED NONE (VERIFIED		B ZCRD0718 98/03/12	1202 213	998

37678	COMPUTER, MICRO	5X022320		L	46944D	1202	4,358
	NEC TECHNOLOGIES INC DI	PC6100-11402			95/12/08	123	
1086067	CAMERA, TELEVISION	2220300939		L	96322C	1209	1,882
	CANON USA INC	HI8	I		91/06/07	809	
1881401	COMPUTER, MICRO, PORTAB	W0XRR		L	9302	1212	2,912
	DELL COMPUTER CORP F-PC	PPI			99/04/28	102	
1881476	DISPLAY, COMPUTER, PROJ	1295		L	9453	1212	3,695
	POLAROID CORP	PV235			99/05/13	102	
1262438	COMPUTER, MICRO	2152524		NAS 1	18980	1212	1,919
	GATEWAY 2000	NEW TOWER			94/06/21	210A	
849136	PRINTER, ADP	8008137			1-18054F	1224T	569
	EPSON AMERICA INC	FX85			89/10/23	.9	
849138	PLOTTER, GRAPHICS	2541A 36790			1-18054F	1224T	1,395
	HEWLETT-PACKARD CO	7475A			86/04/15	.9	
1093485	DISPLAY UNIT	47101121-USZA		80330121400		1224T	1,275
	NANAO-USA	MA1660			92/08/17	.9	
1157783	PRINTER, ADP	3011JH426V		NAS 1	19000	1224T	520
	HEWLETT-PACKARD CO	33471A			92/12/27	.9	
1159277	DISPLAY UNIT	47941012-USZA		21400006		1224T	1,275
	NANAO-USA	NONE			93/01/04	.9	
1159278	COMPUTER, MICRO	621472		21400007		1224T	2,320
	GATEWAY 2000	486			92/12/29	.9	
1160237	TERMINAL, DATA PROCESSI	10330055		L	28684D	1224T	3,199
	HUMAN DESIGN SYSTEMS IN	VIEWSTATION			93/03/11	.9	
57294	COMPUTER, MICRO	F83254H		L	42367C	1224T	3,614
	APPLE COMPUTER INC	M5000			88/08/19	0.1	
61006	PRINTER, ADP	91687541		L	53361C	1224T	1,859
	BROTHER INTERNATIONAL C	HL8			89/04/19	0.1	

61857	COMPUTER, MICRO	TW0087239	L 55570C	1224T	2,590
	AST RESEARCH INC	AST286	89/05/01	0.1	
847459	PRINTER, ADP	2933A11140	L 63897C	1224T	658
	HEWLETT-PACKARD CO	2277A	89/10/03	0.1	
849049	PLOTTER, GRAPHICS	2736A08247	NAS 1 19000	1224T	9,900
	HEWLETT-PACKARD CO	7956A	89/10/13	0.1	
849484	COMPUTER, MINI	B020299	NAS 1 19067	1224T	6,089
	TEKTRONIX INC	XD88/10	90/03/19	0.1	
1084302	PRINTER, ADP	3048A50482	L 89267C	1224T	1,557
	HEWLETT-PACKARD CO	33449A	91/02/28	0.1	
1091153	COMPUTER, MICRO	13301	L 9785D	1224T	4,699
	MARKET WEST COMPUTER GR	GP48633	92/02/14	0.1	
1091154	DISPLAY UNIT	35490021	L 9785D	1224T	500
	TATUNG CO	CM2000	92/02/14	0.1	
1093484	DISPLAY UNIT	48051012-USZA	80330121400	1224T	1,275
	NANAO-USA	MA1660	92/08/17	0.1	
1093488	COMPUTER, MICRO	621473	80330121400	1224T	2,320
	GATEWAY 2000	486/33C	92/08/17	0.1	
1159071	DISPLAY UNIT	5022470	NAS 1 19000	1224T	635
	SONY CORP	1304	92/12/29	0.1	
1159072	DISPLAY UNIT	5023961	NAS 1 19000	1224T	635
	SONY CORP	1304	92/12/29	0.1	
1159075	COMPUTER, MICRO	FC2203AAC53	21400003	1224T	2,190
	APPLE COMPUTER INC	MACII	92/12/29	0.1	
1254733	COMPUTER, MICRO	1288350	L 30978D	1224T	2,485
	GATEWAY 2000	486DX2-50	93/04/07	0.1	
1258702	DISPLAY UNIT	13160042	NAS 1 19000	1224T	986
	RASTEROPS CORP	1649	93/10/14	0.1	
1258706	COMPUTER, MICRO	FC333DHBCAB	31820005	1224T	3,108
	APPLE COMPUTER INC	M1205	93/10/27	0.1	
1263716	COMPUTER, MICRO	F2223JRC724	42010001	1224T	2,920
	APPLE COMPUTER INC	M5780	94/09/15	0.1	

1741423	PRINTER, ADP HEWLETT-PACKARD CO	USBB038120 C3982A	B CB1464 1224T 97/02/04 0.1		953
1160238	TERMINAL, DATA PROCESSI HUMAN DESIGN SYSTEMS IN	10330054 VIEWSTATION	L 28684D 1224T 93/03/11 T10		3,199
58080	PRINTER, ADP APPLE COMPUTER INC	CA835GSH M6000	L 41735C 1224T 88/10/28 100		4,872
1083631	PRINTER, ADP HEWLETT-PACKARD CO	3048A30384 33449A	L 88955C 1224T 91/01/25 100		1,514
1089318	PRINTER, ADP APPLE COMPUTER INC	CA119GEZ M6000	L 7144D 1224T 91/12/10 100		3,135
1257882	COMPUTER, MICRO, PORTAB APPLE COMPUTER INC	FC320E6X441 M4440	L 39222D 1224T 93/09/15 100		3,058
1422696	COMPUTER, MICRO GATEWAY 2000	2683806 NEW TOWER	L 55842D 1224T 94/10/28 100		3,955
1430853	COMPUTER, MICRO APPLE COMPUTER INC	TY62926Y6UK M3979	NAS 1 20005 1224T 96/08/01 100		2,694
1430854	COMPUTER, MICRO APPLE COMPUTER INC	TY62927N6UK M3979	NAS 1 20005 1224T 96/08/01 100		2,694
1430855	COMPUTER, MICRO APPLE COMPUTER INC	TY6292J46UK M3979	NAS 1 20005 1224T 96/08/01 100		2,694
1430857	DISPLAY UNIT APPLE COMPUTER INC	S45450LM5B4 M1823	NAS 1 20005 1224T 96/08/01 100		1,814
1430858	DISPLAY UNIT APPLE COMPUTER INC	S45454625B4 M1823	NAS 1 20005 1224T 96/08/01 100		1,814
1430860	DISPLAY UNIT APPLE COMPUTER INC	SG5494D135 M2935	NAS 1 20005 1224T 96/08/01 100		883
1086596	PRINTER, ADP HEWLETT-PACKARD CO	3112A01185 33449A	L 97358C 1224T 91/06/25 801		1,796
1263418	DISPLAY UNIT DELL COMPUTER CORP F-PC	2AAGGA309 VC8BN	L 51077D 1224T 94/08/24 801		1,637
1424019	DISPLAY UNIT	412011828	L 54583D 1224T		1,076

	DELL COMPUTER CORP F-PC	VC8BN		95/02/06	801	
1262623	PRINTER, ADP	JPBJ067580	L	50478D	1224T	1,408
	HEWLETT-PACKARD CO	C2001A		94/06/30	803	
848665	SCANNER, COMPUTER	9160013	L	66157C	1224T	1,166
	APPLE COMPUTER INC	M0337		89/12/14	805	
1083711	DISK DRIVE UNIT	222099	L	89819C	1224T	1,662
	MASS MICROSYSTEMS INC	DATAPAKII		91/02/04	805	
1087516	PRINTER, ADP	JP05059	L	99557C	1224T	6,178
	TEKTRONIX INC	4694		91/08/22	805	
1090606	PRINTER, ADP	CA117ELO%	L	7363D	1224T	2,545
	APPLE COMPUTER INC	M6000		92/01/21	805	
1256457	DISPLAY UNIT	S431204LD07	L	34027D	1224T	1,098
	APPLE COMPUTER INC	M1298		93/07/22	805	
1257313	SCANNER, COMPUTER	TF3200JTL60	L	38410D	1224T	937
	APPLE COMPUTER INC	M5813		93/08/25	805	
1257468	COMPUTER, MICRO	XB328CVNCC8	L	38701D	1224T	4,393
	APPLE COMPUTER INC	M1206		93/09/14	805	
1264454	DISPLAY UNIT	SSJ430A16712	NAS 1	20006	1224T	1,930
	SONY CORP	461		94/10/12	805	
1422517	COMPUTER, MICRO	XB4380D91H2	NAS 1	20006	1224T	5,094
	APPLE COMPUTER INC	M1688		94/10/27	805	
846230	PRINTER, ADP	791778809	L	56289C	1224T	1,907
	BROTHER INTERNATIONAL C	HL8E		89/06/30	810	
1256743	PRINTER, ADP	USTC036423	L	39196D	1224T	1,336
	HEWLETT-PACKARD CO	C2001A		93/09/29	810	
1261309	COMPUTER, MICRO	2353	L	45258D	1224T	1,558
	COMPUTER TEC INC	486/66		94/03/29	810	
1431567	COMPUTER, MICRO	5039210	L	4692	1224T	1,827
	GATEWAY 2000	BATC		96/09/12	810	
60472	PRINTER, ADP	2830J13256	MISC-GODDAR		1224T	2,748
	HEWLETT-PACKARD CO	33447A		94/04/18	812	
1085203	COMPUTER, MICRO	181061	L	92231C	1224T	2,745

	GATEWAY 2000	386/25		91/04/19	812	
1086634	COMPUTER, MICRO GATEWAY 2000	216640 386/33DXC	L	97377C 91/07/02	1224T 812	2,445
1262988	DISPLAY UNIT DELL COMPUTER CORP F-PC	309006369 VC8BN	L	51077D 94/07/21	1224T 812	1,637
1263697	PLOTTER, GRAPHICS HEWLETT-PACKARD CO	ESB4C23978 C2859B	L	54224D 95/01/12	1224T 812	11,990
1423257	PRINTER, ADP HEWLETT-PACKARD CO	USCB275114 C2005A	NAS 1	20006 94/12/16	1224T 812	1,000
1429489	PRINTER/PLOTTER HEWLETT-PACKARD CO	ESA6306588 C3198A	L	3881 96/06/12	1224T 812	9,421
1093179	COMPUTER, MICRO GATEWAY 2000	610178 486/33C(DESKTO	L	14388D 92/05/29 T 10	1224T	2,460
1741614	STATION, INSTRUMENT INT TRW INC ELECTR & DEFENS	NONE (VERIFIED G449235-1	NAS 1	19039 00/01/10	1224T 1001	55,000
1741618	DISPLAAY UNIT NEC TECHNOLOGIES INC DI	5500418CB XP21	NAS 1	19039 00/01/10	1224T 1001	2,000
1741620	PRINTER, ADP HEWLETT-PACKARD CO	USFB159499 LASERJET4+	NAS 1	19039 00/01/10	1224T 1001	500
1880781	COMPUTER, MINI SILICON GRAPHICS INC	K0014572 CMNA017	NAS 1	20497 98/12/31	1232 122A	246,432
1880782	DISPLAY UNIT SILICON GRAPHICS INC	2003339 GDM90W11	NAS 1	20497 98/12/31	1232 122B	3,500
1086652	PRINTER, ADP APPLE COMPUTER INC	CA051BKR M6000	L	98163C 91/06/28	1232 265	3,386
1160185	DISPLAY UNIT NETWORK COMPUTING DEVIC	415057-181 NCD19C	L	28677D 93/03/03	1232 265	1,500
1424135	TERMINAL, DATA PROCESSI NETWORK COMPUTING DEVIC	0195R000976 HMX	L	361 95/02/17	1232 265	2,596

1881108	COMPUTER, MICRO GATEWAY 2000	13419291 LP MINI TOWER	L	7974 99/04/05	1232 265	2,478
38334	DIGITIZER, MESSAGE PAD APPLE COMPUTER INC	IV6260C06B5 H0196	NAS 1	20004 96/10/17	1232 317	717
1092039	DISPLAY UNIT APPLE COMPUTER INC	FS2044AXA00 M3502	NAS 1	19468 92/04/16	1232 317	3,449
G079237	PRINTER, ADP HEWLETT-PACKARD CO	3034J64115 33449A(III)	L	85378C 90/11/06	1232T 1	1,514
1090568	COMPUTER, MICRO GATEWAY 2000	NONE 486/33E	L	7290D 92/01/15	1232T 1	4,050
1739707	DISPLAY UNIT NEC TECHNOLOGIES INC	6901621LA JC1744UMA	B	CB1413 96/11/27	1232T 1	1,034
G079236	PRINTER, ADP HEWLETT-PACKARD CO	3038J55969 33449A(III)	L	85378C 90/11/06	1232T 2	1,514
1158153	COMPUTER, MICRO SILICON GRAPHICS INC	35251134 CMNB003	NAS 1	19724 92/10/07	1232T 2	20,846
1158154	DISPLAY UNIT SILICON GRAPHICS INC	204001413 HL7965KW-SG	NAS 1	19724 92/10/07	1232T 2	1,560
846782	PRINTER, ADP APPLE COMPUTER INC	CA84783Q M6000	L	60563C 89/08/15	1232T 3	4,619
1258387	DISPLAY UNIT SONY CORP	2004421 2075RO	NAS 1	20005 93/10/05	1232T 3	2,132
55106	TERMINAL, DATA PROCESSI TEKTRONIX INC	B020963 4207	L	36162C 88/04/26	1232T 7	2,876
1160160	COMPUTER, MICRO NETWORK COMPUTING DEVIC	1192K112663 NCD88K	L	28677D 93/03/03	1232T 7	2,157
1160183	DISPLAY UNIT NETWORK COMPUTING DEVIC	415057-178 NCD19C	L	28677D 93/03/03	1232T 7	1,500
1262263	COMPUTER, MICRO DELL COMPUTER CORP F-PC	3QF4L OP566	L	49089D 94/06/10	1232T 7	4,817

1160164	COMPUTER, MICRO NETWORK COMPUTING DEVIC	1192K111975 NCD88K		L	28677D 93/03/03	1232T 11	2,157
1160176	DISPLAY UNIT NETWORK COMPUTING DEVIC	415057-83 NCD19C		L	28677D 93/03/03	1232T 11	1,500
1087236	COMPUTER, MICRO APPLE COMPUTER INC	F12732Y774 M5780		L	00285D 91/07/31	1232T TR 3	3,938
1160154	COMPUTER, MICRO NETWORK COMPUTING DEVIC	1192K111767 NCD88K		L	28677D 93/03/03	1232T TR3	2,157
1160169	DISPLAY UNIT NETWORK COMPUTING DEVIC	415057-176 NCD19C		L	28677D 93/03/03	1232T TR3	1,500
1878773	DISPLAY UNIT HITACHI MFG CO	T8A000119 CM751U516		L	8170 98/08/11	1236 105	537
1878774	COMPUTER, MICRO MICRON ELECTRONICS	1293398-001 AL440LX-P11266		L	8170 98/08/11	1236 105	2,000
1884698	PROJECTOR, VIDEO NEC TECHNOLOGIES INC	2001219M MT1040		L	11130 00/03/22	1236 105	5,707
1742175	COMPUTER, MICRO, PORTAB APPLE COMPUTER INC	QF6511N68JX M3571		B	DAE1022 97/03/27	1236 204	2,340
1884656	COMPUTER, MICRO DELL COMPUTER CORP F-PC	99080 PPX		B	ZCRD0602 00/03/28	1236 204	2,438
38688	SWITCH, OPTIC, QUAD SYSTRAN CORP	314 H-AS-QSW22222-		NAS	1 20454 96/10/30	1244 115	5,495
1087098	COMPUTER, MICRO GATEWAY 2000	NONE 386-25	I	L	97992C 91/07/24	1244 115	7,950
1087099	DISPLAY UNIT NEC INFORMATION SYSTEMS	11M06970 JC1404AMA2	I	L	97992C 91/07/24	1244 115	1,150
1156608	CONCENTRATOR, REMOTE SYNOPTICS COMMUNICATION	762584 2810-02			22820009 92/12/22	1244 115	1,479
1258129	COMPUTER, MICRO	93-4346-29			31670029	1244	2,685

	ZENON COMPUTER SYSTEMS	486DX			93/11/03	115	
1258161	DISPLAY UNIT	Y3G001146			31670028	1244	1,749
	HITACHI MFG CO	2997			93/11/04	115	
1427392	COMPUTER, MICRO	3918009		L	62876D	1244	3,453
	GATEWAY 2000	BABY AT			95/10/31	115	
1429641	MONITOR, TELEVISION	2510533		L	3985	1244	991
	SONY CORP	PVM8041Q	I		96/07/01	115	
1429648	RECORDER, CASSETTE, VID	11122		L	3988	1244	4,966
	SONY CORP	SVO5800	I		96/07/01	115	
1877435	RECEIVER, FIBER OPTIC	6129804		NAS 1	20454	1244	2,423
	LIGHTWAVE COMMUNICATION	VDE/200RX			98/06/16	115	
1877436	RECEIVER, FIBER OPTIC	6129806		NAS 1	20454	1244	2,423
	LIGHTWAVE COMMUNICATION	VDE/200RX			98/06/16	115	
1877437	RECEIVER, FIBER OPTIC	6129808		NAS 1	20454	1244	2,423
	LIGHTWAVE COMMUNICATION	VDE/200RX			98/06/16	115	
1877438	RECEIVER, FIBER OPTIC	6129810		NAS 1	20454	1244	2,423
	LIGHTWAVE COMMUNICATION	VDE/200RX			98/06/16	115	
1883944	TURRET ASSEMBLY	NONE		NAS 1	17929	1244	20,300
	EQUIPTO ELECTRONICS COR	NONE			89/05/09	115	
1430751	DISPLAY UNIT	6600062C		L	4616	1244	5,507
	NEC TECHNOLOGIES INC	LA1332JSW	I		96/09/03	115B	
35542	COMPUTER, MICRO	1501		L	60569D	1244	7,895
	NATIONAL INSTRUMENTS	599			95/05/03	116	
35630	MODULE, INTERFACE	120		L	60814D	1244	7,476
	PACIFIC AVIONICS CORP	ARINC429			95/06/22	116	
35699	MODULE, INTERFACE	113		L	60814D	1244	7,476
	PACIFIC AVIONICS CORP	ARINC429			95/07/07	116	
35700	MODULE	4028		L	60814D	1244	7,970
	PACIFIC AVIONICS CORP	ARINC629			95/07/10	116	

804019	COMPUTER, MICRO	1046		L	52969D	1244	11,585
	NATIONAL INSTRUMENTS	566			94/09/23	116	
1259495	COMPUTER, MICRO	1883500001		L	42089D	1244	1,909
	INDUSTRIAL COMPUTER SOU	7415-23V12			94/01/25	116	
1263338	CHASSIS, ELECTRICAL EQU	12470250		L	52969D	1244	6,460
	NATIONAL INSTRUMENTS	VXI1000			94/08/17	116	
1263339	MONITOR, TELEVISION	N7C0C0		L	52340D	1244	1,500
	CONRAC ELEKTRON GMBH	7114			94/08/17	116	
1259497	COMPUTER, MICRO	1842200009		L	42089D	1244	5,125
	INDUSTRIAL COMPUTER SOU	7415-23V			94/01/25	119	
1425285	CHASSIS, EXPANSION	B020121		L	54167D	1244	22,510
	TEKTRONIX INC	VX1410			95/06/07	119	
1427757	COMPUTER, MICRO	42120580219		NAS 1	20497	1244	3,484
	TEXAS INSTRUMENTS INC	PB300T			95/11/23	119	
404801	PRINTER, ADP	07450284-SH		L	64489B	1244	535
	GENERAL ELECTRIC-DATEL	DPP-Q7A2			84/02/21	121A	
1739745	COMPUTER, FLIGHT MANAGE	96078755		NAS 1	96038	1244	91,691
	HONEYWELL INC AEROSPACE	4052506-941			96/08/19	124	
37136	CAMERA, VIDEO, COLOR	127170		L	3971	1244	1,600
	ELMO MFG CORP	MN401X	I		96/06/27	125	
37226	CAMERA, TELEVISION	37516532		L	64445D	1244	3,946
	DAGE-MTI INC	DC330	I		96/09/05	125	
37227	CONTROL UNIT, CAMERA	37516532		L	64445D	1244	1,900
	DAGE-MTI INC	DC330	I		96/09/05	125	
1883164	COMPUTER, MICRO	15767908		B	ZCRD0677	1244	1,929
	GATEWAY 2000	LP MINI TOWER			99/10/14	128	
1884788	DISPLAY UNIT	19007B085211		B	ZCRD0677	1244	500
	GATEWAY 2000	EV910A			00/04/20	128	
1884894	COMPUTER, MICRO	25MAS		L	11250	1244	2,726

	DELL COMPUTER CORP F-PC	MMS		00/04/19	128	
1884915	COMPUTER, MICRO	25MAP		L 11250	1244	2,582
	DELL COMPUTER CORP F-PC	MMS		00/04/19	128	
21937	GENERATOR, TIME CODE	9919373		L 3319D	1244	3,725
	AVEC ELECTRONICS CORP	4010	I	91/12/02	132	
38484	GENERATOR, SIGNAL	B054687		L 5043	1244	5,122
	TEKTRONIX INC	TSG170A	I	96/11/29	132	
38493	MONITOR, TELEVISION	2500812		L 65398D	1244	1,005
	SONY CORP	PVM5041Q	I	96/12/11	132	
38494	MONITOR, TELEVISION	2500758		L 65398D	1244	1,005
	SONY CORP	PVM5041Q	I	96/12/11	132	
38495	MONITOR, TELEVISION	2500773		L 65398D	1244	1,005
	SONY CORP	PVM5041Q	I	96/12/11	132	
53424	PRINTER, ADP	580260241		L 31251C	1244	518
	NEC INFORMATION SYSTEMS	P660	I	88/02/05	132	
803808	CONVERTER, VIDEO	125434		L 50336D	1244	1,194
	EXTRON ELECTRONICS	EMOTIA	H.,	94/07/07	132	
847120	PRINTER, ADP	289279271		L 61828C	1244	3,275
	NEC INFORMATION SYSTEMS	LC08	I	89/09/22	132	
1086068	CAMERA MOUNT, W/MONITOR	TRA101354		L 96322C	1244	635
	MATSUSHITA ELEC INDUS C	SC100	I	91/06/07	132	
1088916	DISPLAY UNIT	15D02221S		L 1675D	1244	971
	NEC INFORMATION SYSTEMS	JC1601VMA1	I	91/10/29	132	
1089728	MONITOR, TELEVISION	S01-2002448-6		L 3771D	1244	954
	SONY CORP	PVM1344Q/M	I	91/11/08	132	
1254698	COMPUTER, MICRO	1270121		L 29073D	1244	2,365
	GATEWAY 2000	DESKTOP	I	93/03/31	132	
1254699	DISPLAY UNIT	A7442023-USM		L 29073D	1244	1,115
	NANAO-USA	MA1760	I	93/03/31	132	

1255911	COMPUTER, MINI	080069073F32		NAS 1	19468	1244	34,570
	SILICON GRAPHICS INC	CMNB007	I	93/06/16		132	
1255912	DISPLAY UNIT	304014847		NAS 1	19468	1244	1,500
	MITSUBISHI ELECTRIC COR	HL7965KW-SG	I	93/06/16		132	
1258655	RECORDER, CASSETTE, VID	10298		L	39977D	1244	5,308
	SONY CORP	EVO9850	I	93/10/21		132	
1261166	CAMERA, TELEVISION	10598		L	3781D	1244	5,647
	SONY CORP	DXC750	I	91/10/08		132	
1261167	CONTROL, CAMERA, TELEVI	10598		L	3781D	1244	5,647
	SONY CORP	DXC750	I	91/10/08		132	
1345270	TERMINAL	930066B00976		MISC-GODDAR		1244	5,564
	AT AND T INFORMATION SY	DDM-PLUS	I	95/10/26		132	
1426974	COMPUTER, MICRO	NONE (VERIFIED		L	62707D	1244	898
	MICROMAX DISTRIBUTION	NONE (VERIFIED	I	95/10/16		132	
1429529	MONITOR, TELEVISION	2006428		L	3987	1244	994
	SONY CORP	PVM5041Q	I	96/06/18		132	
1430498	SWITCHER, VIDEO	6960717		L	4285	1244	1,105
	VIDEOTEK INC	RS103	I	96/07/26		132	
1604779	SYNCHRONIZER	7B29D022		L	5281	1244	3,654
	DIGITAL PROCESSING SYST	DPS290D	I	97/03/06		132	
1613254	CONVERTER, 3 CHANNEL	22		L	70018D	1244	3,500
	SEKAI ELECTRONICS OF AM	REI8350	I	99/09/24		132	
1613300	CONVERTER, 3 CHANNEL	21		L	70018D	1244	3,500
	SEKAI ELECTRONICS OF AM	REI8350S	I	99/09/24		132	
1613328	SWITCHER, VIDEO	547502		L	70018D	1244	2,633
	EXTRON ELECTRONICS	ER9867A	I	99/09/24		132	
1613329	SWITCHER, VIDEO	547509		L	70018D	1244	2,633
	EXTRON ELECTRONICS	ER9867A	I	99/09/24		132	
1613330	SWITCHER, VIDEO	547508		L	70018D	1244	2,633

	EXTRON ELECTRONICS	ER9867A	I		99/09/24	132	
1613331	SWITCHER, VIDEO	547499		L	70018D	1244	2,633
	EXTRON ELECTRONICS	ER9867A	I		99/09/24	132	
1613332	SWITCHER, VIDEO	547506		L	70018D	1244	2,633
	EXTRON ELECTRONICS	ER9867A	I		99/09/24	132	
1613333	DISK DRIVE UNIT	3085547		L	70018D	1244	2,000
	SONY CORP	CRX100E	I		99/09/24	132	
1613334	SWITCHER, VIDEO	547505		L	70018D	1244	2,633
	EXTRON ELECTRONICS	ER9867A	I		99/09/24	132	
1613439	SWITCHER, VIDEO	547511		L	70018D	1244	2,633
	EXTRON ELECTRONICS	ER9867A	I		99/09/24	132	
1739360	COMPUTER, MICRO	5444139		B	GN1113	1244	1,625
	GATEWAY 2000	BATC	I		96/10/10	132	
1739824	CONVERTER, AUTO SCAN	8540169		L	5173	1244	19,716
	YEM AMERICA INC	CVS980H	I		96/12/09	132	
1873719	COMPUTER, MICRO	7492677		L	6364	1244	3,532
	GATEWAY 2000	LP MINI TOWER	I		97/07/23	132	
1880476	SYNCHRONIZER, PCM FORMA	125		L	8760	1244	13,390
	GENERAL DATA PRODUCTS I	225D1	I		99/02/16	132	
1882203	DISPLAY UNIT	19007B040740U		B	ZCRD0678	1244	500
	GATEWAY 2000	EV910	I		99/08/11	132	
1882234	COMPUTER, MICRO	14565837		B	ZCRD0678	1244	1,865
	GATEWAY 2000	TBR2500PLL	I		99/08/11	132	
1882945	CONVERTER, SCAN, VIDEO	17101		L	70018D	1244	12,617
	RGB TECHNOLOGY DBA RGB	1700D1	I		99/09/24	132	
1882946	CONVERTER, SCAN, VIDEO	17188		L	70018D	1244	12,617
	RGB TECHNOLOGY DBA RGB	1700D1	I		99/09/24	132	
1882947	CONVERTER, SCAN, VIDEO	17116		L	70018D	1244	12,617
	RGB TECHNOLOGY DBA RGB	1700D1	I		99/09/24	132	
1882948	CONVERTER, SCAN, VIDEO	17138		L	70018D	1244	12,617

	RGB TECHNOLOGY DBA RGB	1700D1	I	99/09/24	132		
1882949	CONVERTER, SCAN, VIDEO	17196	L	70018D	1244	12,617	
	RGB TECHNOLOGY DBA RGB	1700D1	I	99/09/24	132		
1882950	CONVERTER, SCAN, VIDEO	17127	L	70018D	1244	12,617	
	RGB TECHNOLOGY DBA RGB	1700D1	I	99/09/24	132		
1882951	CONVERTER, SCAN, VIDEO	17157	L	70018D	1244	12,617	
	RGB TECHNOLOGY DBA RGB	1700D1	I	99/09/24	132		
1882952	RECORDER, CASSETTE, VID	13164	L	70018D	1244	8,053	
	SONY CORP	DSR80	I	99/09/24	132		
1882953	RECORDER, CASSETTE, VID	12751	L	70018D	1244	8,053	
	SONY CORP	DSR80	I	99/09/24	132		
1882954	RECORDER, CASSETTE, VID	12777	L	70018D	1244	8,053	
	SONY CORP	DSR80	I	99/09/24	132		
1882955	RECORDER, CASSETTE, VID	12766	L	70018D	1244	8,053	
	SONY CORP	DSR80	I	99/09/24	132		
1882956	RECORDER, CASSETTE, VID	13154	L	70018D	1244	8,053	
	SONY CORP	DSR80	I	99/09/24	132		
1882957	RECORDER, CASSETTE, VID	13149	L	70018D	1244	8,053	
	SONY CORP	DSR80	I	99/09/24	132		
1882958	RECORDER, CASSETTE, VID	12775	L	70018D	1244	8,053	
	SONY CORP	DSR80	I	99/09/24	132		
1882959	DISPLAY UNIT	2708292	L	70018D	1244	1,100	
	SONY CORP	CPD520GS	I	99/09/24	132		
1882960	MONITOR, TELEVISION	2011667	L	70018D	1244	1,916	
	SONY CORP	PVM20M2U	I	99/09/24	132		
1882962	DISK DRIVE UNIT	91020	L	70018D	1244	2,000	
	SONY CORP	ESBK7045	I	99/09/24	132		

1882963	COMPUTER, MICRO	13082		L 70018D	1244	51,770
	SONY CORP	ES7	I	99/09/24	132	
1947830	VOICE COMMUNICATION, TE	15282		MISC	1244	1,150
	PADS DEVELOPMENT LABS I	2000116-100	I	99/12/01	132	
139829	COMPUTER, MICRO	2.8612E+11		L 16776C	1244	3,525
	PC'S LIMITED SEE DEL CO	AT114(286)	I	87/04/02	138	
1261983	DISPLAY UNIT	205004639		NAS 1 19468	1244	1,500
	MITSUBISHI ELECTRIC COR	HL7965KW-SG	H.,	94/05/06	138	
1429773	COMPUTER, MICRO	66013440		L 64442D	1244	3,851
	NEC TECHNOLOGIES INC DI	PC6120-71702	I	96/07/09	138	
1524074	DISPLAY UNIT	5306489KG		MISC-WALLOP	1244	996
	NEC ELECTRONICS USA INC	XE15	I	95/10/24	138	
1159232	COMPUTER, MICRO	92359935		21400009	1244	2,320
	GATEWAY 2000	2189014	I	92/12/29	139	
37135	CAMERA, VIDEO, COLOR	127176		L 3971	1244	1,600
	ELMO MFG CORP	MN401X	I	96/06/27	141	
37224	CAMERA, TELEVISION	37516550		L 64445D	1244	3,946
	DAGE-MTI INC	DC330	I	96/09/05	141	
37228	SYNCHRONIZER, DIGITAL	6G265007		L 64445D	1244	4,850
	DIGITAL PROCESSING SYST	DPS265	I	96/09/05	141	
37233	GENERATOR, SIGNAL	B044642		L 64698D	1244	5,150
	TEKTRONIX INC	TSG170A	I	96/09/04	141	
38298	MONITOR, VIDEO, WAVEFOR	1467068		L 4246	1244	1,410
	LEADER INSTRUMENTS CORP	5864A	I	96/07/19	141	
38299	GENERATOR, SIGNAL	1347038		L 4246	1244	1,600
	LEADER INSTRUMENTS CORP	413S	I	96/07/19	141	
38300	VECTORSCOPE	1667328		L 4246	1244	1,505
	LEADER INSTRUMENTS CORP	5854	I	96/07/19	141	

1429530	MONITOR, TELEVISION	2006423		L	3987	1244	994
	SONY CORP	PVM5041Q	I		96/06/18	141	
1429642	MONITOR, TELEVISION	2510524		L	3985	1244	991
	SONY CORP	PVM8041Q	I		96/07/01	141	
1429644	MONITOR, TELEVISION	2510525		L	3985	1244	991
	SONY CORP	PVM8041Q	I		96/07/01	141	
1429645	RECORDER, CASSETTE, VID	10847		L	3988	1244	4,966
	SONY CORP	SVO5800	I		96/07/01	141	
1429646	RECORDER, CASSETTE, VID	10991		L	3988	1244	4,966
	SONY CORP	SVO5800	I		96/07/01	141	
1429647	RECORDER, CASSETTE, VID	11003		L	3988	1244	4,966
	SONY CORP	SVO5800	I		96/07/01	141	
1429649	RECORDER, CASSETTE, VID	11091		L	3988	1244	4,966
	SONY CORP	SVO5800	I		96/07/01	141	
1429650	RECORDER, CASSETTE, VID	10997		L	3988	1244	4,966
	SONY CORP	SVO5800	I		96/07/01	141	
1429662	MONITOR, TELEVISION	2500139		L	3987	1244	994
	SONY CORP	PVM5041Q	I		96/07/05	141	
1429663	MONITOR, TELEVISION	2500138		L	3987	1244	994
	SONY CORP	PVM5041Q	I		96/07/05	141	
1429664	MONITOR, TELEVISION	2500137		L	3987	1244	994
	SONY CORP	PVM5041Q	I		96/07/05	141	
1429665	MONITOR, TELEVISION	2500140		L	3987	1244	994
	SONY CORP	PVM5041Q	I		96/07/05	141	
1430483	SWITCHER, VIDEO	7960517		L	4285	1244	1,105
	VIDEOTEK INC	RS103L	I		96/07/26	141	
1430484	SWITCHER, VIDEO	6960558		L	4285	1244	1,105
	VIDEOTEK INC	RS103L	I		96/07/26	141	
1430485	SWITCHER, VIDEO	7960516		L	4285	1244	1,105
	VIDEOTEK INC	RS103L	I		96/07/26	141	

1430486	SWITCHER, VIDEO	7960518		L	4285	1244	1,105
	VIDEOTEK INC	RS103L	I		96/07/26	141	
1430487	SWITCHER, VIDEO	7960515		L	4285	1244	1,105
	VIDEOTEK INC	RS103L	I		96/07/26	141	
1430488	SWITCHER, VIDEO	7960514		L	4285	1244	1,105
	VIDEOTEK INC	RS103L	I		96/07/26	141	
1430491	SWITCHER, VIDEO	6960716		L	4285	1244	1,105
	VIDEOTEK INC	RS103	I		96/07/26	141	
1430492	SWITCHER, VIDEO	6960721		L	4285	1244	1,105
	VIDEOTEK INC	RS103	I		96/07/26	141	
1430494	SWITCHER, VIDEO	6960715		L	4285	1244	1,105
	VIDEOTEK INC	RS103	I		96/07/26	141	
1430495	SWITCHER, VIDEO	6960720		L	4285	1244	1,105
	VIDEOTEK INC	RS103	I		96/07/26	141	
1430496	SWITCHER, VIDEO	6960722		L	4285	1244	1,105
	VIDEOTEK INC	RS103	I		96/07/26	141	
1430497	SWITCHER, VIDEO	6960718		L	4285	1244	1,105
	VIDEOTEK INC	RS103	I		96/07/26	141	
1430652	CONVERTER, AUTO SCAN	NONE (VERIFIED		L	64846D	1244	20,595
	YEM AMERICA INC	YEM CVS980H	I		96/08/20	141	
1430709	CONVERTER, SCAN, DIGITA	2100719		L	4376	1244	3,805
	SONY CORP	DSC1024	I		96/08/28	141	
1430752	DISPLAY UNIT	6600045C		L	4616	1244	5,507
	NEC TECHNOLOGIES INC	LA1332JSW	I		96/09/03	141	
1739204	RECORDER, CASSETTE, VID	12324		L	4412	1244	4,966
	SONY CORP	SV0=5800	I		96/09/26	141	
1739250	CONVERTER, SCAN	8540159		L	4792	1244	19,717
	YAMASHITA ENGINEERING	CVS980HN	I		96/09/19	141	
1739251	CONVERTER, SCAN	7900109		L	4792	1244	19,717
	YAMASHITA ENGINEERING	CVS980HN	I		96/09/19	141	
1875918	COMPUTER, MICRO	8831607		L	7311	1244	1,157
	GATEWAY 2000	LP MINI DESKTO			98/01/06	144A	

1430558	DISPLAY UNIT SONY CORP	8526685 CPD15F23		L	4301 96/08/07	1244 156	400
1740264	COMPUTER, MICRO GATEWAY 2000	6037597 ATX TOWER	H.,	B	GLB3438 96/12/03	1244 160	2,359
1743152	COMPUTER, MICRO TOSHIBA HOSHASEN CO LTD	03765814-3 430CDT		B	ZCRD0620 97/07/17	1244 160	2,339
60470	PRINTER, ADP HEWLETT-PACKARD CO	2830J13254 33447A		L	52083C 89/03/06	1244 209	2,748
1258014	DISPLAY UNIT HITACHI MFG CO	X93040280 CM2097AD3SM		NAS 1	20005 93/09/29	1244 209	1,807
1263419	COMPUTER, MICRO APPLE COMPUTER INC	XB411K0317B M1688		L	50557D 94/08/24	1244 209	12,999
1741268	PRINTER, ADP HEWLETT-PACKARD CO	USBB056374 C3982A		L	5399 97/02/04	1244 209	979
1086787	COMPUTER, MICRO GATEWAY 2000	223407 386/33DXC		L	98062C 91/07/01	1244 219	4,155
1430556	COMPUTER, MICRO GATEWAY 2000	5018655 BATC		L	4301 96/08/07	1244 219	1,962
1158065	PRINTER, ADP HEWLETT-PACKARD CO	3227A17658 33449A		L	23584D 92/12/29	1244 232	1,462
1262233	COMPUTER, MICRO GATEWAY 2000	1048951 TOWER		NAS 1	18980 94/05/09	1244 232	1,919
1424018	DISPLAY UNIT DELL COMPUTER CORP F-PC	412011826 VC8BN		L	54583D 95/02/06	1244 232	1,076
61147	DISPLAY UNIT NEC INFORMATION SYSTEMS	85K27400Z JC1402HMA	I	NAS 1	18054 89/04/27 243A	1244	660
1429640	MONITOR, TELEVISION SONY CORP	2510523 PVM8041Q	I	L	3985 96/07/01	1244 557	991
1429643	MONITOR, TELEVISION SONY CORP	2510531 PVM8041Q	I	L	3985 96/07/01	1244 557	991
1739754	MONITOR, TELEVISION	2513230		L	4999	1244	969

	SONY CORP	PVM8041Q	I	96/11/14	557		
1739755	MONITOR, TELEVISION	2513217	L	4999	1244		969
	SONY CORP	PVM8041Q	I	96/11/14	557		
547764	DISPLAY, THRUST VECTOR	NONE	L	73648B	1244		2,000
	CHRIS DOMACK	THRUST VECTOR		84/12/10	.110A		
1429639	MONITOR, TELEVISION	2510519	L	3985	1244		991
	SONY CORP	PVM8041Q	I	96/07/01	0.115		
1430546	CHASSIS, EXPANSION (12S	CN040	L	64653D	1244		5,225
	MOTOROLA COMMUNICATIONS	MVME946		96/08/05	0.115		
37225	CONTROL UNIT, CAMERA	37516550	L	64445D	1244		1,900
	DAGE-MTI INC	DC330	I	96/09/05	0.124		
1426973	COMPUTER, MICRO	NONE (VERIFIED	L	62707D	1244		898
	MICROMAX DISTRIBUTION	NONE (VERIFIED	I	95/10/16	0.132		
1426975	COMPUTER, MICRO	NONE (VERIFIED	L	62707D	1244		898
	MICROMAX DISTRIBUTION	NONE (VERIFIED	I	95/10/16	0.132		
1085522	COMPUTER, MICRO	190726	L	95290C	1244		2,595
	GATEWAY 2000	38625DX		91/05/21	0.209		
21662	LENS, ZOOM	136	L	3311D	1244		4,760
	FUJINON INC	A8X12BMD	I	91/10/11	CONX		
58310	RECEIVER, SATELLITE	406827	NAS1	18655F	1244		800
	CHAPARRAL INDUSTRIES IN	3	I	88/10/07	CONX		
58311	RECEIVER, SATELLITE	400435	NAS1	18655F	1244		800
	CHAPARRAL INDUSTRIES IN	3	I	88/10/07	CONX		
1088459	CAMERA, VIDEO	865359	L	3319D	1244		1,899
	AVEC ELECTRONICS CORP	CN401E	I	91/10/10	CONX		
1425310	SWITCHER, VIDEO	A9504361	L	1373	1244		3,792
	LEITCH INC	HD16X16V	I	95/06/19	CONX		
1425329	SWITCHER, AUDIO	A9504360	L	1373	1244		2,242
	LEITCH INC	HD16X16AM	I	95/06/19	CONX		
1430489	SWITCHER, VIDEO	6960559	L	4285	1244		1,105

	VIDEOTEK INC	RS103L	I	96/07/26	CONX			
1430490	SWITCHER, VIDEO	7960513	L	4285	1244			1,105
	VIDEOTEK INC	RS103L	I	96/07/26	CONX			
1430493	SWITCHER, VIDEO	6960719	L	4285	1244			1,105
	VIDEOTEK INC	RS103	I	96/07/26	CONX			
1612716	ANNUNICATOR	103	L	7319	1244C			3,705
	SIMTEK INC	10-3123-01		98/09/02	116A			
1612717	ANNUNICATOR	104	L	7319	1244C			3,705
	SIMTEK INC	10-3123-01		98/09/02	116A			
1884840	COMPUTER, MICRO, PORTAB	31300131	L	11095	1244C			9,079
	FIELDWORKS INC	FW8000-366		00/04/17	160			
1884841	COMPUTER, MICRO, PORTAB	31200138	L	11095	1244C			9,079
	FIELDWORKS INC	FW8000-366		00/04/17	160			
1884842	COMPUTER, MICRO, PORTAB	31200139	L	11095	1244C			9,079
	FIELDWORKS INC	FW8000-366		00/04/17	160			
846487	DISPLAY UNIT	39490113	L	59527C	1244T			466
	GATEWAY 2000	CM1495		89/08/09	100			
1087170	PRINTER, ADP	H0014773	L	99178C	1244T			1,949
	QMS INC	PS410-1		91/07/30	100			
1876725	PRINTER, ADP	USMC019924		NAS 1 20497	1244T			1,437
	HEWLETT-PACKARD CO	C4120A		98/03/26	100			
143009	DISPLAY, GENERAL AVIATI	NONE		EMS MEMO	1244T			1,500
	MARTIN MARIETTA CORP	AVIATION		84/10/01	0.4			
547763	DISPLAY, EMERGING TECH	NONE	L	73648B	1244T			1,750
	CHRIS DOMACK	EMERGING		84/12/10	0.4			
550841	DISPLAY, SS BUSINESS JE	NONE		EMS MEMO	1244T			1,500
	MARTIN MARIETTA CORP	BUSINESS-JET		84/10/01	0.4			
1741612	STATION, INSTRUMENT INT	1		NAS 1 19039	1250			55,000
	TRW INC ELECTR & DEFENS	G449225-1		00/01/10	123N			

1741613	STATION, INSTRUMENT INT TRW INC ELECTR & DEFENS	2 G449225-1	NAS 1 19039 00/01/10	1250 123N	55,000
1741616	DISPLAAY UNIT NEC TECHNOLOGIES INC DI	542I155DB XP21	NAS 1 19039 00/01/10	1250 123N	2,000
1741617	DISPLAAY UNIT NEC TECHNOLOGIES INC DI	542I57DB XP21	NAS 1 19039 00/01/10	1250 123N	2,000
1741400	TRAILER, PLATFORM 48' DORSEY TRAILERS INC	1DTP10Z29VG051 DGTS48	L 65702D 97/03/05	1250 YARD	20,505
848037	COMPUTER, MICRO SUN MICROSYSTEMS INC	938F3261 147(4/60FC8)	L 62159C 89/10/10	1251 HALL	9,250
1883079	DISK DRIVE UNIT CUTTING EDGE INC.	400-00261 PS-4/18N	B ZCRD0685 99/10/13	1298	765
1875633	DISPLAY UNIT SONY CORP	7119920 CPD20SF2	B ZCRD0683 97/12/23	1298 116	999
1088890	DISK DRIVE UNIT ANDATACO	1I04000634 ADT702D	L 4147D 91/10/17	1298 118	2,363
1091638	COMPUTER, MICRO SUN MICROSYSTEMS INC	206G4083 47B(4/40CN8)	NAS 1 19468 92/04/01	1298 118	4,856
1091641	DISPLAY UNIT SUN MICROSYSTEMS INC	9143DY1622 GDM1662B	NAS 1 19468 92/04/01	1298 118	600
1264242	COMPUTER, MICRO APPLE COMPUTER INC	FC4381883YJ M2391	L 49956D 94/08/18	1298 124	2,447
1261879	COMPUTER, MICRO DELL COMPUTER CORP F-PC	3K8GT XPSP60D	L 39784D 94/04/28	1298 128A	3,722
1427880	DISPLAY UNIT SONY CORP	SSJ537A16178 461	B DF01040 95/12/06	1298 135	2,099
1428467	COMPUTER, MICRO APPLE COMPUTER INC	FC5525BT3FX M3979	NAS 1 20005 96/03/21	1298 135	3,205
1264235	PRINTER, ADP EPSON AMERICA INC	1500-031571 STYLUS COLOR	L 55222D 94/09/30	1298 137	539

1257077	COMPUTER, MICRO GATEWAY 2000	1502951 DESKTOP	L 36231D 93/08/04	1298 140	2,545
1091639	COMPUTER, MICRO SUN MICROSYSTEMS INC	209G1334 47B(4/40CN8)	NAS 1 19468 92/04/01	1298 141	4,856
1879166	DISPLAY UNIT SONY CORP	9301DN1144 GDM1662B	NAS 1 19468 98/09/15	1298 141	600
G074393	COMPUTER, MICRO APPLE COMPUTER INC	F01144T740 M5780	L 73544C 90/04/20 142B	1298	5,440
138684	COMPUTER, MICRO HITECH INTERNATIONAL	171613 SAM3001AT	L 13163C 87/01/28 142B	1298	1,975
143066	DISPLAY UNIT NEC INFORMATION SYSTEMS	6XC06461C JC1401P3A	L 12303C 86/12/22 142B	1298	595
1092720	DISPLAY UNIT NEC AMERICA INC BROADCA	1YD00325S JC2002VMA1	L 17779D 92/07/02	1298 143	1,630
1158930	DISPLAY UNIT SUN MICROSYSTEMS INC	9245DX0777 GDM1962B	NAS 1 19468 92/12/09	1298 143	3,900
1158932	COMPUTER, MICRO SUN MICROSYSTEMS INC	246M2782 47B	NAS 1 19468 92/12/09	1298 143	3,116
1424247	COMPUTER, MICRO APPLE COMPUTER INC	FC5020X244G M2391	NAS 1 20260 95/02/24	1298 143	2,434
1880080	SCANNER, COMPUTER HEWLETT-PACKARD CO	2812J64875 9195A	L 86357C 90/12/20	1298 143	1,052
1158117	DISK DRIVE UNIT SEAGATE	MR020148 ST42400N	L 22066D 92/10/06	1298 147	2,755
1158931	COMPUTER, MICRO SUN MICROSYSTEMS INC	246M0234 47B	NAS 1 19468 92/12/09	1298 147	3,116
847345	COMPUTER, MICRO SUN MICROSYSTEMS INC	936F2138 147(4/60M1-8P4	L 57466C 89/09/27	1298 149	8,736
1428580	DISPLAY UNIT PHILIPS	932BM9208 M19P114	L 57466C 96/04/11	1298 149	1,200
G077560	COMPUTER, MICRO SUN MICROSYSTEMS INC	033F0756 147B4/60MI8	L 76731C 90/09/11 150A	1298	8,700

847286	DISK/TAPE DRIVE	932G0475		L	57459C	1298	5,810
	SUN MICROSYSTEMS INC	EXP2			89/09/22	150A	
G074394	DISK DRIVE UNIT	124087		L	73544C	1298	945
	MASS MICROSYSTEMS INC	DATAPAK			90/04/20	151	
1430122	DISK DRIVE UNIT	96070012		NAS 1	20005	1298	2,687
	ZZYZX FORMLY UNISUN PER	ZDG/J512SS9115			96/07/19	151	
1262493	DISPLAY UNIT	7105153		L	50653D	1298	2,190
	SONY CORP	2075RO			94/06/28	BALC	
1739508	DISPLAY UNIT	7004015-3		L	4731	1298	700
	GATEWAY 2000	CPD-GF200			96/10/18	BALC	
1257075	DISPLAY UNIT	MHH114546		L	36231D	1298T	400
	GATEWAY 2000	CS1572FS			93/08/04	TR 2	
60917	DISPLAY UNIT	85D60015Z		L	53158C	1299	580
	NEC INFORMATION SYSTEMS	JC1402HMA			89/04/10	142	
G076165	MULTIMETER, DIGITAL	5061300		L	79176C	1299	1,273
	FLUKE JOHN MFG CO INC	8842A	,		90/07/20	237	
61793	MULTIMETER, DIGITAL	4742289		L	53555C	1299	1,395
	FLUKE JOHN MFG CO INC	8842A	,		89/04/27	237	
1429013	COMPUTER, MICRO	NONE (VERIFIED		L	63947D	1299	2,872
	UNKNOWN (VERIFIED)	NONE (VERIFIED	,		96/05/17	237	
1429677	DISPLAY UNIT	M461701401		L	63947D	1299	1,400
	VIEWSONICS INC	2082G2	,		96/06/18	237	
60916	COMPUTER, MICRO	NONE		L	53158C	1299	4,340
	JOIN DATA TECHNOLOGY	386			89/04/10	241	
1156470	COMPUTER, MICRO	NONE		L	18178D	1300	2,350
	IBS RESEARCH INC.	DX2-50			92/08/31	214	
1611008	DISK DRIVE UNIT	RBCH1956R6		B	ZCRD0686	1300	150
	IOMEGA	DDXZ100P2			97/07/29	226	
1739506	PRINTER, ADP	JPCD074179		L	4731	1300	540
	HEWLETT-PACKARD CO	C3941A			96/10/18	226	
1739507	COMPUTER, MICRO	5783023		L	4731	1300	2,368
	GATEWAY 2000	BATC			96/10/18	226	

1880723	COMPUTER, MICRO GATEWAY 2000	12692969 LP MINI TOWER	B	ZCRD0685 99/03/17	1300 229B	1,751
1880724	DISPLAY UNIT GATEWAY 2000	U8K012622 VX900	B	ZCRD0685 99/03/17	1300 229B	500

TOTAL ITEMS:	**TOTAL ACQ VALUE:**
360	1,772,731